

**BRAZILIAN PETROCHEMICAL
INDUSTRY: IN SEARCH OF
NEW COMPANY
STRATEGIES**

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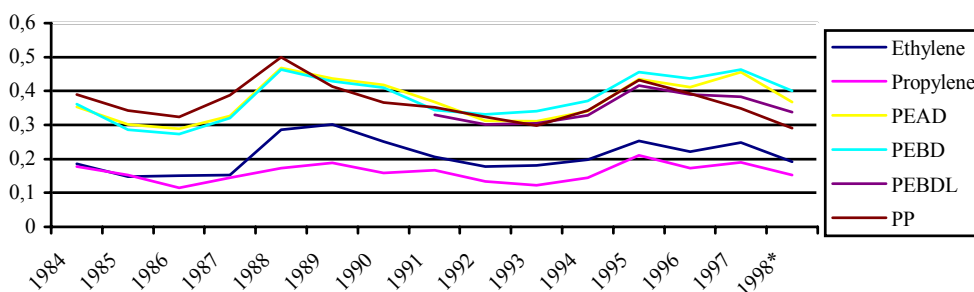
Abstract

The object of this work is to discuss the implementation of strategies that could result in structural modifications within the Brazilian petrochemical industry. The two identifiable movements calling for the restructuring of company directives are: *a)* the adoption of product differentiation strategies; and, *b)* the need to integrate industrial complexes. The confirmation of these two movements could result in modifications to the price cycles in the petrochemical industry.

The Cyclical Nature of the Petrochemical Industry

Traditional analysis considers the cyclical nature of the petrochemical industry as one of its principal characteristics. In this context, profitability is directly connected to the internal logic of the cycle, whose principal condition is reflected in the relationship between product supply and demand.

Chart 1
Prices for Ethylene, Propylene and Polyolefin
(In US\$ per pound, FOB U.S.Gulf)



Obs.: PEAD = high-density polyethylene; PEBD = low-density polyethylene; PEBDL = linear low-density polyethylene; and PP = polypropylene.

Source: *Probe Economics*.

Forecast

A recent work of Butler in the McKinsey Quarterly (1998), analyses four hypothesis that explain the causes of cyclical tendencies: the first is in agreement with the accepted industry point of view where the balance between supply and demand is depressed when significant additional capacity comes on line (as a result of scales of economy); the second affirms that companies lose investment timing as a result of the lack of reliable information related to the capacity of other suppliers; the third suggests that the imbalance between supply and demand are caused by the tendency of companies to invest at the top of the cycle, when returns are elevated (and resources are available), but demand levels are nearing their peak; and the fourth indicates that the producers frequently plan new capacity without accurate demand projections.

When testing each theory in a dynamic model, Butler *et al* at McKinsey showed that the structural cost advantages presented by technological position, location and inventory practices, obtained by a minority of

companies, generate substantial profit gains. Most of the companies which do not have the advantage of a cost structure, however, can administer the cycle to increase their profitability. Two principal causes have been identified for these cycles, as well as two ways in which to eliminate the negative effects of the cycles: the removal of financial constraints that impede companies from investing during low periods, and the utilization of more precise methods of measuring demand.

As can be observed further on, the differentiation should reduce the adverse effects of price cycles, thereby attenuating the relevance of financial restrictions, and the integration of industrial complexes tied to the petrochemical industry should make possible the utilization of more accurate methods for estimating demand.

2. The Strategy of the Resin Manufacturing Company: Differentiation

Charles Kline [see Nunes (1998)] classifies petrochemical products as *commodities* and *pseudo-commodities*, considering that *commodities* are products of large volume, whose purchase is based on a chemical specification that, once reached, does not present any quality parameter that distinguishes between the suppliers, such as, for example, olefins, oxyalkoloids, monoethyleneglycol (MEG), ethylbenzene etc.

The *pseudo-commodities* group comprises large volume products that are not purchased by chemical specification, but rather by their performance, such as PP, PEAD, PEBD, PEBDL, PS. This category has acquired an ever increasing differentiation of products, due to the specific performance needs required by clients.

A recent study of the technological scenario presented by the polymer industry [see Antunes and Bontempo (1998)] calls attention to the differentiation efforts utilized by the leading companies producing resin. The new products obtained from the metallocene catalyzers, as well as the other “advanced” products derived

from Ziegler-Natta catalyzers, have been placed on the market, which recognized them as differentiated in relation to those materials already existing.

On the other hand, the generation of new products, like the special polymers (PP e PS) and the polycyclo-olifins, are also creating molecular structures that are entirely new, allowing for an accelerated rhythm of innovations that, in the future, will radically modify the manner in which the industry will envision and commercialize its products.

Within this transformation it is also important to call attention to the utilization of higher-precision machinery, which makes possible the manufacturing of products of lesser width, modifying the specifications required of the resin and utilizing it in smaller quantities. This innovation also represents a product differentiation for the end user.

Foreseeable for the short and medium term is a technological scenario which can be defined as evolutionary. Along these lines, the appearance of better performing products, that are also better adapted to specific conditions, are moving some segments of the industry to diversify from their product line, increasing the space for orders of specialty products. This tendency appears to effectively verify, in commercial terms, within some specific segments of the polyethylenes and elastomers market and can be found in the development of the polypropylene market.

Once again it is important to state that the largest market is that of the undifferentiated *commodities* and *pseudo-commodities* and, consequently, is conducive to the internal logic of the industry, presenting accentuated advantages for those companies with reduced production costs, that are located near to raw materials and located near principal consumer markets. Those companies that intend to supply these markets search for ever increasing production scales, which juxtapose the differentiation of products.

Consequently, in the evolutionary scenario, the capability of determining end markets, developing differentiated solutions for users through efforts based on the technology of the products, becomes a critical competitive factor. Through the utilization of specific grades and comprised of petrochemical products, the producers have been opening new markets, substituting other materials and attacking the inter-competition between polymers. It is important to note that this strategy has been used by the resin producer to expand the market in periods of excess capacity, but the positive effects on the margins of differentiated products has been small. This occurs, for the most part, because the plastics producer is still not willing to pay more for the differentiated product, despite the fact that the introduction of more modern machinery should alter this reality, when placing orders for differentiated resins.

The development of a differentiation strategy depends on diverse internal factors within the organization and, above all, the integration of the supply network participants, a factor to be analyzed below.

The Integration of the Petrochemical Complex

The adoption of a differentiation strategy is strongly tied to the integration of the petrochemical complex, which can be implemented by diverse methods, among which are the verticalization of activities, the acquisition of companies throughout the complex, or establishing partnerships and alliances between clients and suppliers. Whatever might be the solution, it is necessary to have in existence a information system that permits the resin supply companies to be fully aware of the consumption needs of the end user.

Since 1980, integration, through partnerships and alliances, has been the most successful solution for the petrochemical industry and other industries, because it permits each ring of the complex to remain focused on its principal activities, while participating in a common strategy that allows for increasing the efficiency of the supply complex as a whole. Through long-term partnerships and alliances are substituted for unequal negotiations suppliers and clients, based only on bargaining power, have generated more efficient systems.

Bowersox and Closs (1996) confirm that, to implement a higher degree of cooperation between participants it is necessary that information be shared throughout the complex. By exchanging information and mutual planning it is possible to eliminate or reduce duplicated stocks, which represent the high costs and risks associated with the variations in prices. In this context, the development of information technologies and data processing have been an essential factor, as well as promoting the management of the distribution channel.

Strategic alliances permit specific processes to be administered under a perspective of channel distribution, thus expanding the traditional supplier/company/client perspective. Through the administration of the complex, final consumer satisfaction becomes the objective of all of the participants. In this manner, the processes of each company can be modified to improve the performance of the entire complex.

With respect to the principal industrial complexes tied to the Brazilian petrochemical industry, the strategy of integration through partnerships presents some difficulties with respect to implementation. The differences that exist between the size of the plastics industry firms, one side, and the producers of resin and final consumer goods, on the other, tend to generate a unequal bargaining power, that can lead to a lack of equilibrium in the appropriation of the margins if there do not exist accords that permit improved equity in the distribution of profit.

Nevertheless, for there to be improved performance of the products due to the technical characteristics of the resins, integration is an indispensable factor. In addition, the companies obtain fiscal advantages and reductions in the cost of transport and storage, which are significant with respect to the large volumes that are negotiated. An additional advantage is the development of new products. Through the utilization of combined teams from the complex participants, is possible to pre-identify problems and reduce cycles in product development.

The relationships between the companies should be implemented through long-term accords or contracts that take into consideration supply and demand throughout the complex, creating a strong and long-lasting bond between the supplier and the client. These accords should be renegotiated when necessary, generating equilibrium and reducing opportunistic gains in relation to specific market situations that would benefit only one of the rings of the complex.

The specific characteristics of each complex bring forward differentiated relations that exist between the companies. For this reason we will attempt to analyze below the principal complexes tied to the petrochemical industry.

The Industrial Complex in Brazil

In general, the resin manufacturing industry supplies the plastics industry, that, on its part, sells its products to the consumer goods industries. These industries have specific logistics, some lead by producers (*producer-driven*), others by wholesalers (*buyer-driven*), the last mentioned have shown considerable growth. Finally, there exists a large diversification of markets that is structured in many distinct forms, and in some industries, including those where the complex leadership is exercised by transnational companies, with decisions being taken outside of the country.

Still, it is well to remember that the plastics industry is being impacted by the downstream industries (automotive, electronic and food processing etc.) and the upstream companies (second generation of resin suppliers), that have carried the weakening effects of horizontal relations and the aligning of the plastic transformation companies in the different productive complexes.

As noted by Fleury and Fleury (1998), the plastic transformation companies have been historically specialized in processing (injection, extrusion etc.), supplying different markets and clients in a relatively

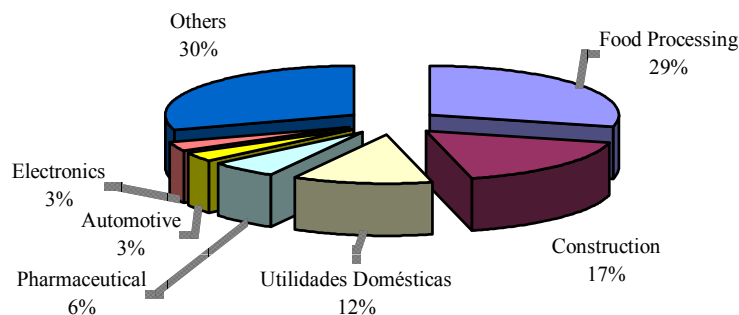
indiscriminant manner. These companies chose products in a manner which maximized the utilization of the installed productive capacity when the market was classified as a sellers market.

With the opening of the market and the intensification of the globalization process, the market has become a buyers market, and an increased number of companies are now required to go through a stage that focuses their activities, identifying their core businesses and their clients/markets. The conditions that will allow them to remain as participants in determined complexes have been redefined. Graph 2 shows the final destination of the transformation plastic industry in 1998.

Graph 2

Sector Distribution of the Plastics Market - 1998

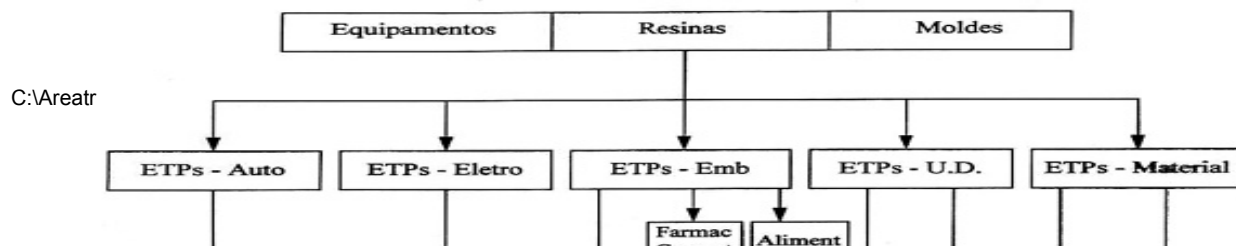
Source: Abiplast.



The Fleury e Fleury Study (1998) indicates the principal downstream resin complexes (in other words, those companies that consume plastic products) and studies the governing structures that coordinate and control their activities dispersed geographically (Graph 3).

Graph 3

Structure of the Petrochemical Productive Complex



Source: Fleury and Fleury (1998).

Notas do Tradutor: Tradução da imagem acima.

Line 1: Equipment, Resins, Molds

Line 2: FTPS – Material

Line: 3 Pharm – Cosmetics.

Line 4: Assembles, Assemblers, Industries, Distribution, Construction

In the following, we present details related to the principal industrial complexes for petrochemical products, in an effort to show the structures of the networks and their *governance*, as can be verified in Fleury and Fleury (1998).

The Packaging Complex

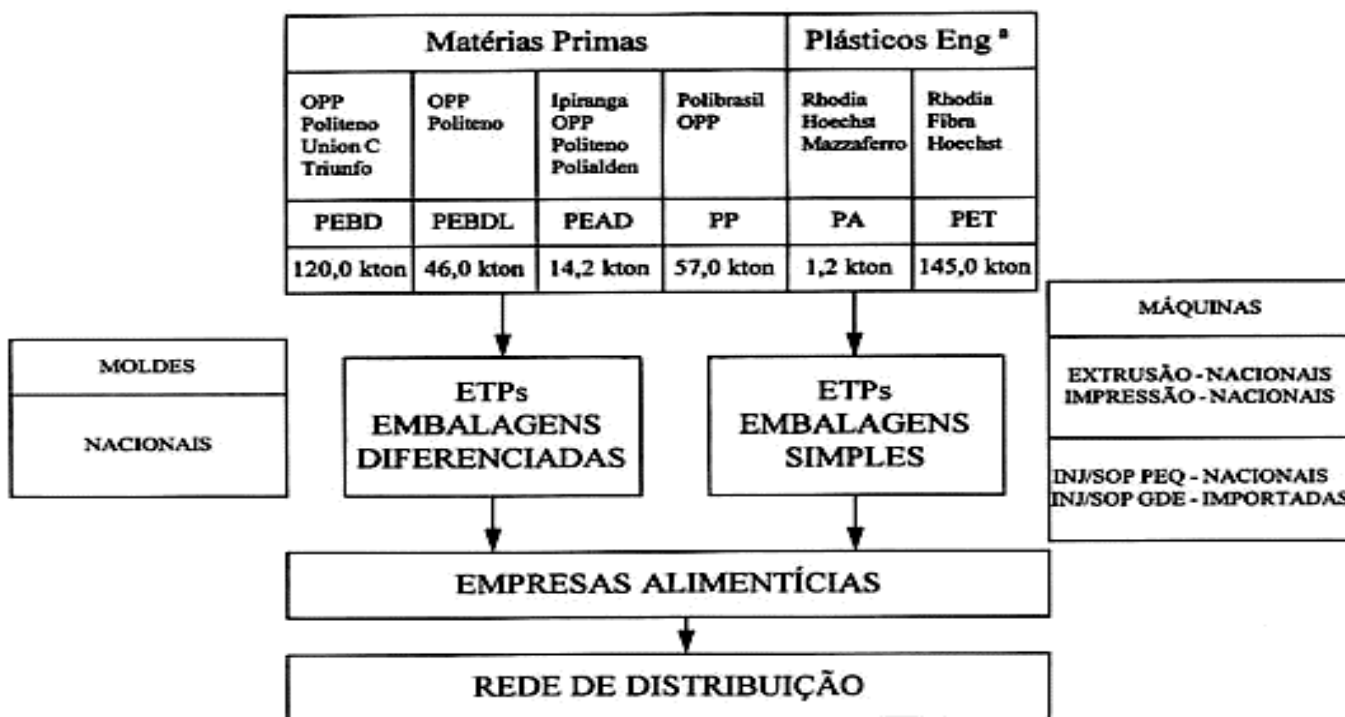
The packaging producers complex includes an extremely wide and diversified universe, and the authors call attention to the studies of the plastics manufacturing companies in the food packaging complex, industrial packaging and packaging for pharmaceutical and cosmetics.

The food processing packaging company is presently commanded by the large distribution networks. Some companies (food processing, oils, beverages etc.) well developed plans for dedicated servicing of the packaging of their high volume products through the utilization of in-house plants. With respect to complex packaging, the competition is by differentiation and in the more simple, by cost.

With respect to the companies that supply industrial packaging, in most cases, there is a certain amount of specialization, and the relationship with the client is more restricted. In the case of packaging for the pharmaceutical and cosmetic market, the area is part of an increasing segment that is in the process of internationalization due to specific dynamic innovations with strong marketing and trend influences.

Graph 4

DIAGNÓSTICO - FLUXOS NA CADEIA DE EMBALAGENS

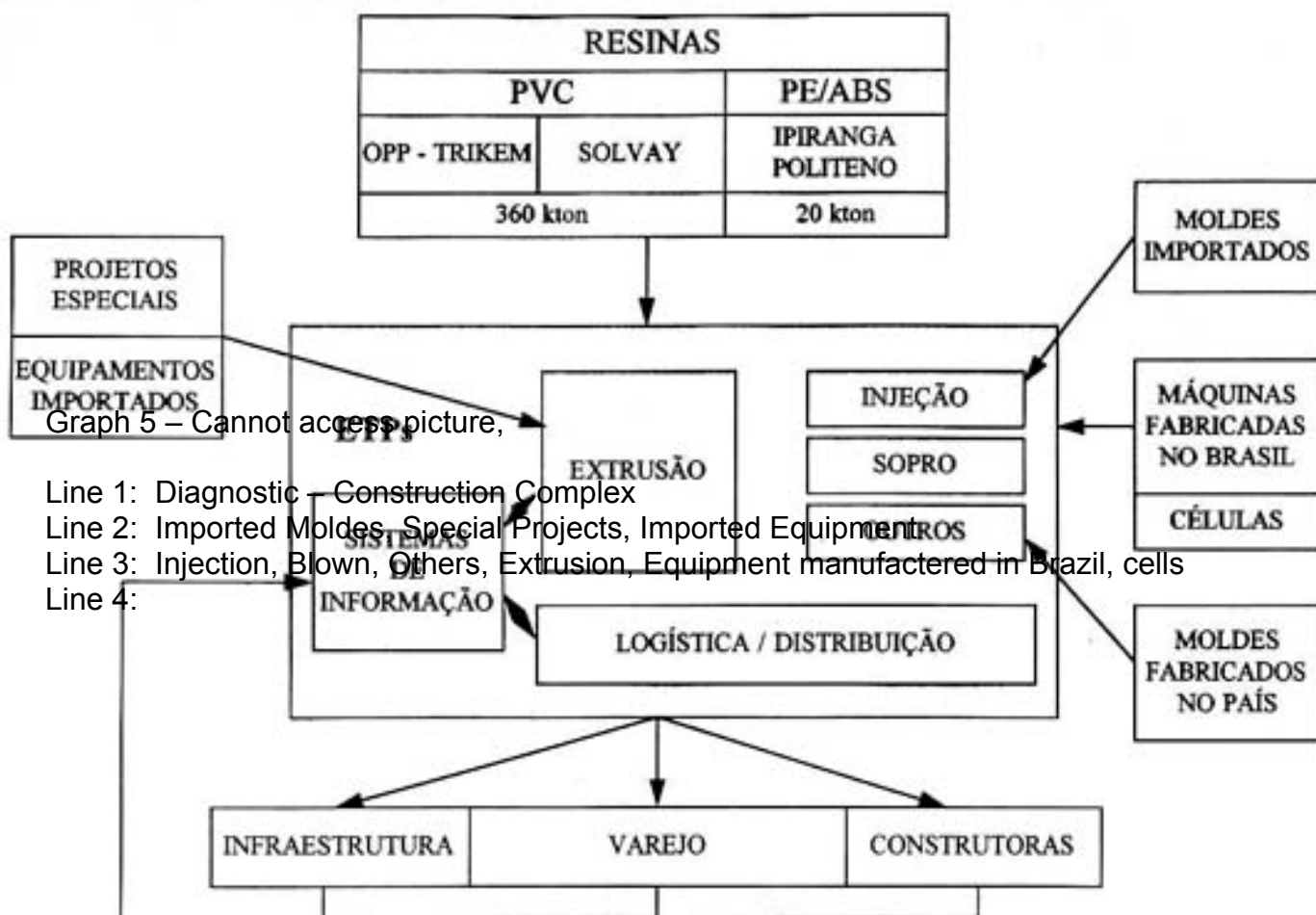


The Construction Complex

The construction complex is, for the most part, commanded by large local companies, as well as projects initiated by the government (infrastructure) and smaller projects (retail), which are an important part of distribution. The plastics industry competes by price, due to the large availability of standardized products.

Graph 5

Graph 5
DIAGNÓSTICO - FLUXOS NA CADEIA DE CONSTRUÇÃO CIVIL



Graph 5 – Cannot access picture,
 Line 1: Diagnostic – Construction Complex
 Line 2: Imported Molds, Special Projects, Imported Equipment
 Line 3: Injection, Blown, Others, Extrusion, Equipment manufactured in Brazil, cells
 Line 4:

Nota do Tradutor:

Line 1: Diagnostic – Variations in the Construction Complex

Line 2: Imported Molds, Special Projects, Imported Equipment

Line 3: Extrusion, Injection, Blowing, Others

Line 4: Molds manufactured in Brazil

Line 5: Information Systems

Line 6: Logistics/Distribution

Line 7: Molds Manufactured in Brazil

Line 8: Infrastructure, Retail, Construction Firms

Source: Fleury and Fleury (1998).

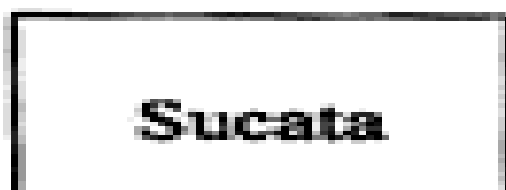
The Automotive Complex

The automotive complex, that appears with additional details in Graph 6, is commanded by the assembly firms and/or the *mega-suppliers*, that require of suppliers specific products, which promotes the necessity for coordination among the participants. The competitive requisites required by the complex are related to international price, quality and just-in-time delivery. Also important is total domination of technology and financial health.

Graph 6

DIAGNÓST

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Source: Fleury and Fleury (1998).

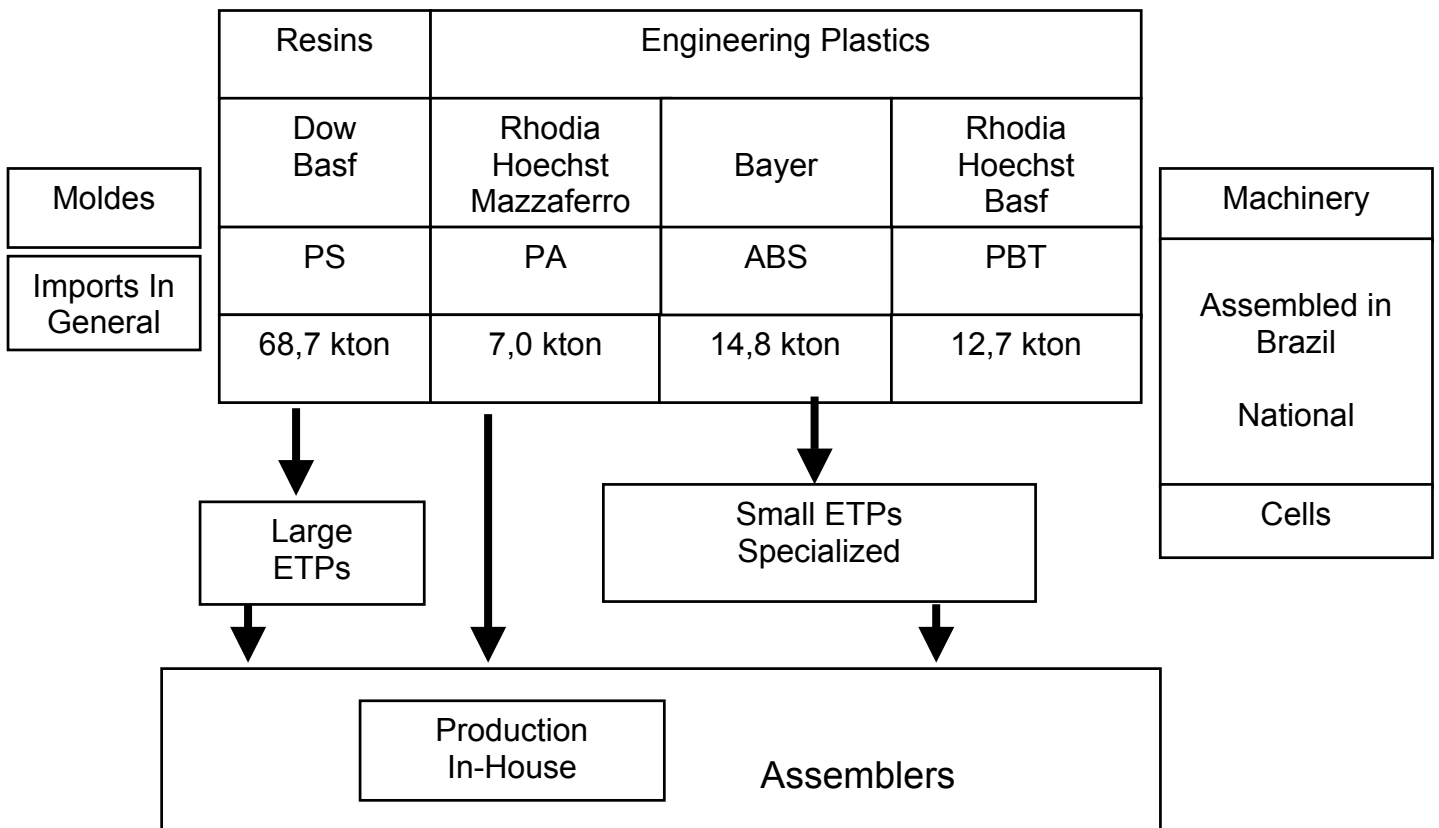
The development of new worked products have created the possibility of alliances between assemblers and/or *mega-suppliers* and the suppliers of resins based on the *global sourcing plan*. For example, the following companies can be cited: Ford with Dow, Philips with Dow, Renault with Rhône-Poulenc, OPP/Borealis with Ford, among others.

The Electronic Complex

The electronic complex is following the same trajectory as the automotive complex, with just small differences. According to Fleury and Fleury, the large companies are also moving toward the development of world products and subcontracting the development and supply of parts and components from small preferential suppliers, that dominate the supply complexes on a world scale. The competitive requisites specified are the same as those in the automotive complex.

Graph 7

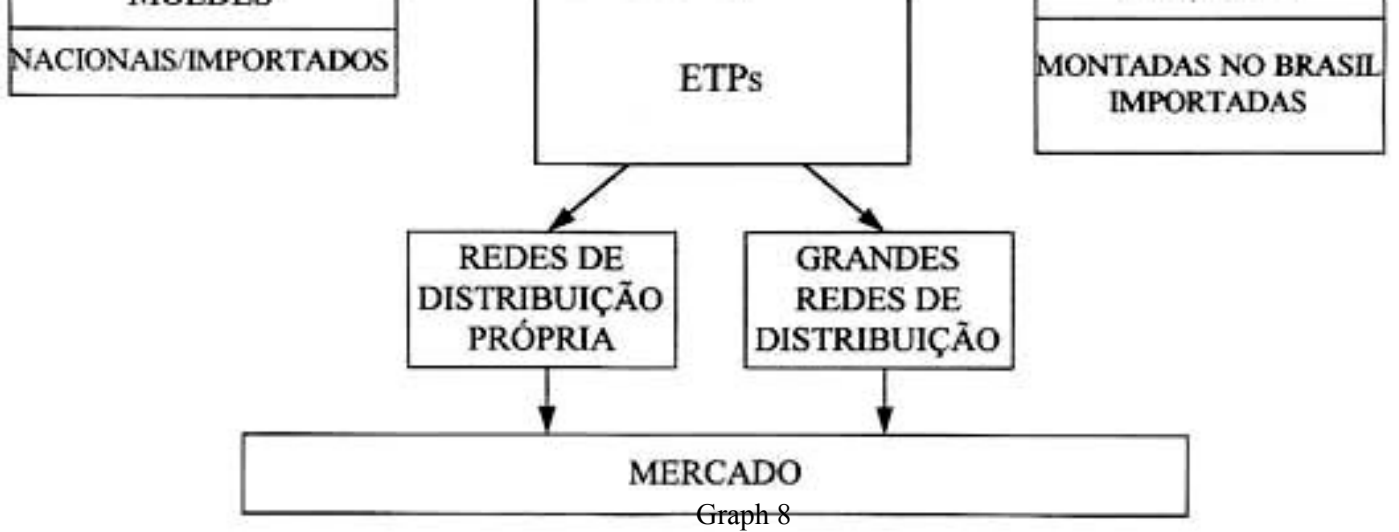
Diagnosis: – Variations in the Electronic Complex



Source: Fleury and Fleury (1998).

The Home Appliance Complex

The plastic products for domestic use are the escape valve for the companies that influence other complexes. Nevertheless, there are few companies focused on this market and they basically consist of two groups of companies: one that competes by prices and attempts to increase scale and the other the competes by design and quality.



Graph 8

Source: Fleury and Fleury (1998).

Nota do Tradutor: Imagem não pode ser manipulada.

Title: Diagnostic: Variations in the Home Appliance Complex

Line 1: Resins

Line 2: Molds, Domestic/Imported, Machinery, Assembled in Brazil, Imported

Line 3: Company Distribution Networks, Large Distribution Networks

Differentiation Strategies and the Integration of Diverse Industrial Complexes

Differentiation strategy can be utilized as an alternative to increase the participation in consumer markets or to raise the profitability of companies. However, for there to exist a differentiation of products the leaders of the industrial complex need to increase integration. This integration, to be effective, requires the development of information systems and long-term relationships that allow for an improvement in the forecasting of demand, a reduction in the costs of warehousing and an increase in efficiency throughout the complex.

In an analysis of the diverse complexes in which the plastics industry participates, it can be stated that:

- In the packaging complex, the leadership is exercised by those industries that consume petrochemical products (food processing, pharmaceuticals and manufacturers of cosmetics etc.):
 - The types of packaging for food can be classified as complex and simple. In the complex packaging, the plastic is added to diverse materials that differentiate the product, resulting in meeting the needs of more sophisticated consumption. Therefore, the resultant competition, because of the differentiation, and the pressure upon the plastic transformation companies (in terms of prices, quality, delivery and innovation) is determined by the dynamic competition between the large food processing companies, by the dynamic competition between the distribution networks and the play of forces between them, with the intention of acquiring the generated value. In addition, this complex is strongly influenced by the need to meet the requirements of public health regulations. With respect to simple packaging, in those sectors that are not regulated, the informal sector is important, excessively effecting the strategies of other companies.
 - Despite being rougher in composition, industrial packaging requires a certain specialization associated with the specific prerequisites of industrial clients. There are also a great number of small companies that produce products for small businesses on a local and regional level.

- The packaging for cosmetics and pharmaceuticals are in an ever increasing process of internationalization due to specific innovations and are strongly influenced by trends and advertising that increase confidence in product quality.
- In general, one can note some integration in the packaging sector, principally in the development of new products, that take into consideration the chemical specifications of raw materials capable of providing packaging with ideal properties for warehousing, transport, preservation and practicality, which is important for the end user. Nevertheless, this integration is still modest in scope, generating inefficiency throughout the complex. According to data provided by resin producers, The loss of foodstuffs in Brazil as a result of inadequate packaging reaches 20%, while in the more developed nations these losses are only 4%.
- In the construction area, the leadership of the complex is not well defined. There exist strong associations that have access to information through efficient and organized systems that are capable of predicting demand. The plastics transformation companies that operate in this market are large, with well-know brand names and good logistical structures. In addition, the petrochemical products utilized are essentially *pseudo-commodities*, that makes a strategy of differentiation difficult.
- The automotive and electronic complexes are well integrated and, consequently, reap the benefits of the efficiency of integration. The strategy of leadership practiced by the assemblers (multinational companies) in the automotive industry, is conducive to the long-term relationships between suppliers and clients, as well as the dissemination of information throughout the complex.
- In the electronic complex the large firms (multinationals) are also attempting to develop world products and subcontracting the development and the supplying of parts and components from a small number of preferential suppliers that dominate the supply networks on a international level. The assemblers also control this complex, who possess industrial parks, as well as some in-house plants.

- The integration of the home appliances sector is still weak. This occurrence is the result of the small number of companies (for the most part small and medium companies, though there do exist some large firms) focused on this market segment. It must be stated that some companies that focus on other segments occasionally enter this market, manufacturing home appliances as a temporary alternative to their normal range of products.

As can be observed in the following, divergent cases in the petrochemical industry have achieved integration throughout the complex by partnerships and long-term alliances, as well as verticalization of activities and stock participation.

Normally, the partnerships and alliances between suppliers and clients diminish when new differentiated products are introduced into the market by the resin producers, for example, between OPP Petroquímica and Fiat, with respect to the development of automobile bumpers for the Palio model. The contract initiative began with OPP, which saw an opportunity in the autoparts market based on the properties of polypropylene produced in its new industry unit. Beginning with the initial contact, the development of the part was produced in conjunction with the engineers of OPP and Fiat. Afterwards, Plascar, a plastics transformation company was contacted to actually fabricate the part and, through negotiations, the long-term relations were defined between all parties.

An example of the development of new products beginning with the relationship between the resin manufacturer with the special equipment, is the packaging made from palm trees, developed through a partnership between OPP and Embrasa, and is being placed on the market by Cimento Ribeirão. The product has a greater resistance to tearing and humidity, a vital characteristic for cement packaging, as well as being reusable. To obtain packaging with these characteristics, the German company Windmoeller began in 1993 to develop, in conjunction with OPP, a piece of machinery for the automatic production of palm packaging, whose operation in the sacking of cement was identical to the operation using paper sacks. Last year, the first piece of this equipment arrived in Brazil, imported by Embrasa, and OPP began the

development of a special polypropylene that permits a high velocity operation with this equipment. The results was a product that improves the transport and stocking of cement, reducing the damage index of 3% to 0,2%, and is being placed on the market by Cimento Ribeirão in packages of 25 and 50 kilograms.

There are also cases of new product development based on requests by the consumer goods producer. Nestlé wanted to increase the security of the packaging of its chocolate drink powder Nescau, so that it would have a greater resistance, increase the life of the product and principally, eliminate alterations that were occurring. Politeno was contracted to develop a type of polyethylene, asking Forplás to make an operational adoption of the machine. The Japanese group Sonoco became interested in this market in Brazil and purchased 50% of the capital of Forplás.

New products are also developed due to the interest of large plastic transformers. Tigre and Fortilit, which wanted to substitute the asbestos in the fabrication of water tanks, because of the health problems and environmental issues related to this material, went to Politeno, which had developed a resin of PEAD, already approved by the market and that could be used by the injection process as well as rotomolding. Tigre and Fortilit produced the product by injection and Torres and Isdralit by rotomolding.

There also exist cases of verticalization of activities as a solution for integrating the complex. As an example, the companies CCE, Multibrás and Gradiente, located in Manaus, and the assemblers of electronic appliances have plants for plastics transformation in their industrial facilities, producing cabinets, and a range of other parts. The molds come from Taiwan and Portugal. The integration of the complex is only between the transformation industry and the final consumer's goods. The purchase of the resin is made on the spot market.

The verticalization strategy, through participation acquisition in other companies of the complex, can be seen in the production of polyethylene terephthalate (PET), a sector which the Grupo Mariani opted to participate with Engenpack Embalagens S.A., a plastic bottle manufacturer, Proppet S.A., a producer of PET resin and

the principal raw material, dimethyl terephthalate (DMT). The Grupo Rhodia also had participation in the three stages of the complex – purified terephthalate acid (PTA), through Rhodiaco; and PET and bottles, through Rhodia Ster –, but sold its participation in the production of bottles. It is worth while stating again that the integration of this complex reaches to the producer of beverages through the operation of any number of *in-house* plants operated by the bottle producer. Another example of verticalization is the participation of Dow in Spuma Pack.

Conclusion

Integration permits companies to take advantage of efficiency gains throughout the entire industrial complex. Through the options of integration the partners and alliances have the advantage of being able to permit each participant to maintain their focus on their principal activity, which should be accomplished through long-term accords/contracts, meeting the demand of diverse participants of the complex, and based on the exchange of information and trust between the partners.

Among the operational and strategic benefits generated by the implementation of alliances, it is important to cite: the reduction of costs and stocks, increased efficiency in projecting demand, improved productivity and quality, improved client services and joint development of markets, reduction of risks and a greater potential for the generation of competitive advantages.

The integration of the complex is essential for the success of the strategy of differentiation. On the other hand, the principal opportunities of integration of the complex have occurred in the development of new differentiated products. Both integration and differentiation movements, therefore, are independent and both have a common logic.

The differentiation of products due to the increase in new technologies have created niches in the market, whose compartment is different from the *commodities market*, where the cost is the principal competitive difference. New products arising from the changes in formulation/composition have expanded, actually,

inter-materials competition and inter-polymers, and its future participation should increase the diffusion of new technologies that permit the development of *tailor-made* polymers.

In the long term, if the tendencies of integration and differentiation are confirmed, thus increasing the importance of new products in the market, there will occur modification in the price cycles of the petrochemical industry. There should occur a flattening of the curves, attenuating the instability and periodic crises that today are characteristic in the petrochemical industry. This effect will be reduced by an improved ability to predict demand, as a function of the complex, and an improvement in the financing and productive capacity, with respect to the differentiation of products.

It is worth mentioning that these movements do not indicate the end of price cycles. The *commodities* market should continue as the highest volume of business, generating a lack of structural equilibrium between supply and demand. These, however, should be reduced by the existence of specific segments of the market, directed toward differentiated products, which appears to be the long-term tendency of the industry.

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