

THE STUDY ON A DEVELOPMENT PLAN
FOR
PETROCHEMICAL DOWN-STREAM INDUSTRIES
IN
THE EMPIRE OF IRAN

VOLUME IV
MARKET DEVELOPMENT

SEPTEMBER, 1978

JAPAN INTERNATIONAL COOPERATION AGENCY

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ABBREVIATIONS

General

C&F	Cost & Freight
FOB	Free on Board
GDP	Gross Domestic Products
GNP	Gross National Products
ROE	Return on Equity
ROI	Return on Investment
NA	Not available

Company & Organization

APC	Abadan Petrochemical Co.
ICDC	Iran Chemical Development Co.
IJPC	Iran Japan Petrochemical Co.
IRNIP	Iran Nippon Petrochemical Company
JETRO	Japan External Trade Organization
MITI	Ministry of International Trade & Industry, Japan
NIOC	National Iranian Oil Co.
NPC	National Petrochemical Co.
OPEC	Organization of Petroleum Exporting Countries

Units

ton	metric ton
lb	libra (pound)
bbl	barrel
MMBTU	million British Thermal Unit
KW	kilowatt
KWH	kilowatt hour

Plastics

ABS	Acrylonitrile-butadiene-styrene Copolymer
AS	Acrylonitrile-styrene Copolymer
DOP	Diethyl Phthalate
EDC	Ethylene Dichloride
EVA	Ethylene-vinyl-acetate Copolymer
PE	Polyethylene
HDPE	High Density Polyethylene
LDPE	Low Density Polyethylene
PP	Polypropylene
OPP Film	Oriented PP Film
CPP Film	Cast PP Film
PS	Polystyrene
HI, HIPS	High Impact Polystyrene
GP, GPPS	General Purpose Polystyrene
FS	Foamed Polystyrene, Expandable Polystyrene
PU	Polyurethane
PVC	Polyvinyl Chloride
uPVC	Unplasticized PVC
SF	Structural Foam
VCM	Vinyl Chloride Monomer

Synthetic Rubber

BR	Butadiene Rubber
IIR	Isobutylene-isoprene Rubber
NR	Natural Rubber
SBR	Styrene Butadiene Rubber
H-SBR	High Styrene SBR
SBR-MB	SBR Master Batch
SR	Synthetic Rubber

Synthetic Fiber Raw Material

AH Salt	Nylon 66 Salt
AN	Acrylonitrile
DMT	Dimethyl Terephthalate
FY	Filament Yarn
o-Xylene	Ortho-xylene
p-Xylene	Para-xylene
SF	Staple Fiber
TPA	Terephthalic Acid
p-TPA	Pure Terephthalic Acid

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I RELATIONSHIP AMONG THE GOVERNMENT, MATERIAL SUPPLIERS, PROCESSORS, AND USERS

1. Structure of the Plastics Market

There is a supply/demand relationship between the plastics materials and the products, thereby forming a market within the so-called plastic industry. This market inside the industry is called here as the internal market. On the other hand, the steps from the sale of the products in the market until the final consumption of the same is called here is the external market.

(1) Internal market

The basic structure of the internal market is as shown in Fig. I-1-1. The following are the features of this market:

(a) Technically oriented market

In this market, the consumers of the materials are at the same time the producers of the products. Therefore, the relationship here is production-sale-production. Therefore, the quality guarantee of the materials is the prerequisite condition of the transactions, and processability of the materials becomes the most important function of the materials. For the processors, easiness in handling is the primary requirements of the materials for the purpose of minimizing the processing loss, thereby maximizing the production efficiency. This point can be easily understood by the fact that PE, PS, and other thermo-plastic materials have displayed a remarkable growth because mainly of their easy processability.

The products turned out as a result of the processing will then be evaluated and assessed as to their quality once after they are placed on the market for sale. Therefore, for the plastics materials manufacturers, one of the important problems is to maintain a wholesome balance between the processability and the quality.

(b) The functions of the sales enterprises are important

Many sales enterprises engage themselves in the two-way transactions, i.e., sale of the plastics materials and of the plastics products. Along with the development of the processing industry as well as the geographic distribution profile of the consumption market, the functions of the sales

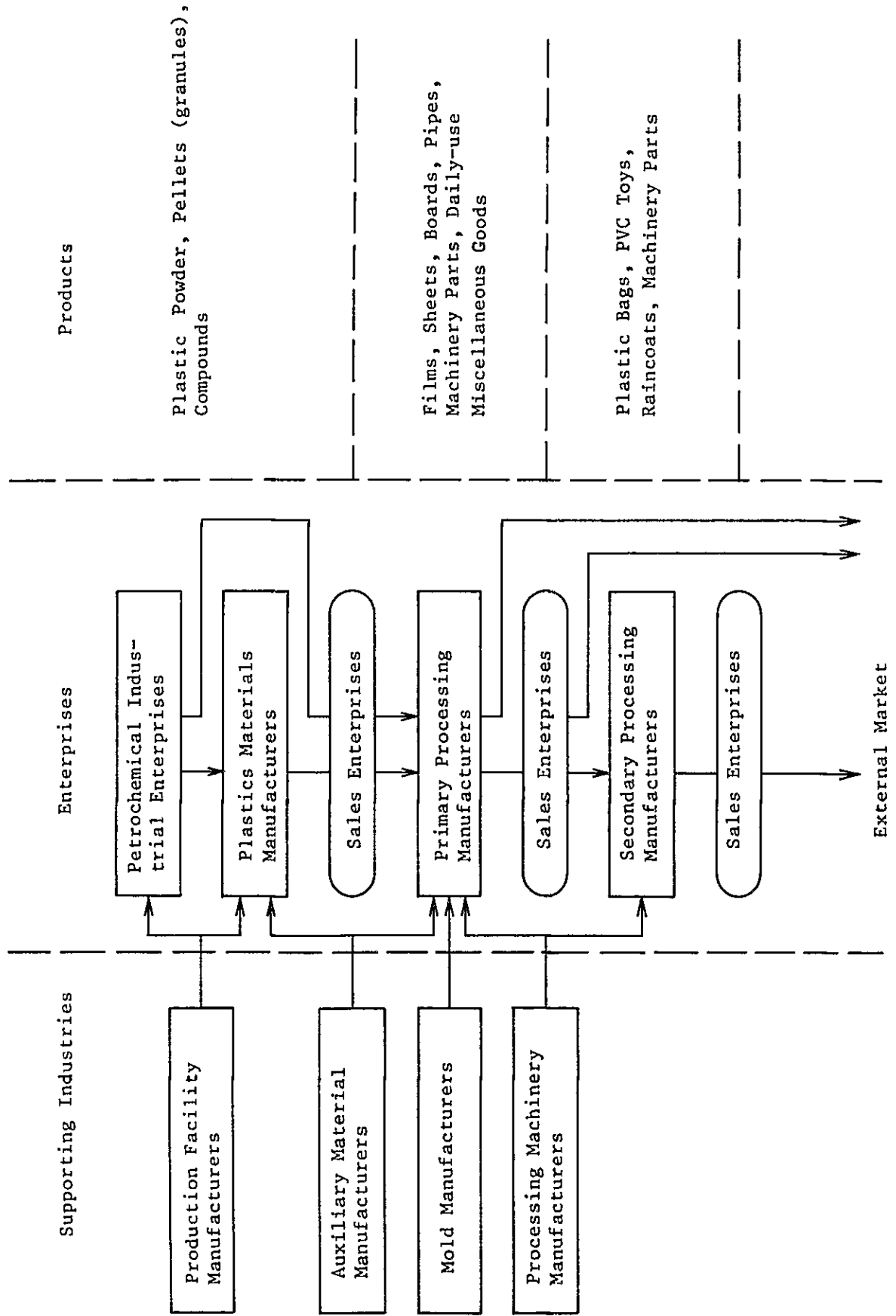


Fig. I-1-1 Structure of the Internal Market of Plastics Products

enterprises becomes increasingly important. As has been discussed earlier, the sales enterprises are compelled to employ technical service engineers because of the technically-oriented nature of the plastics materials.

(2) External market

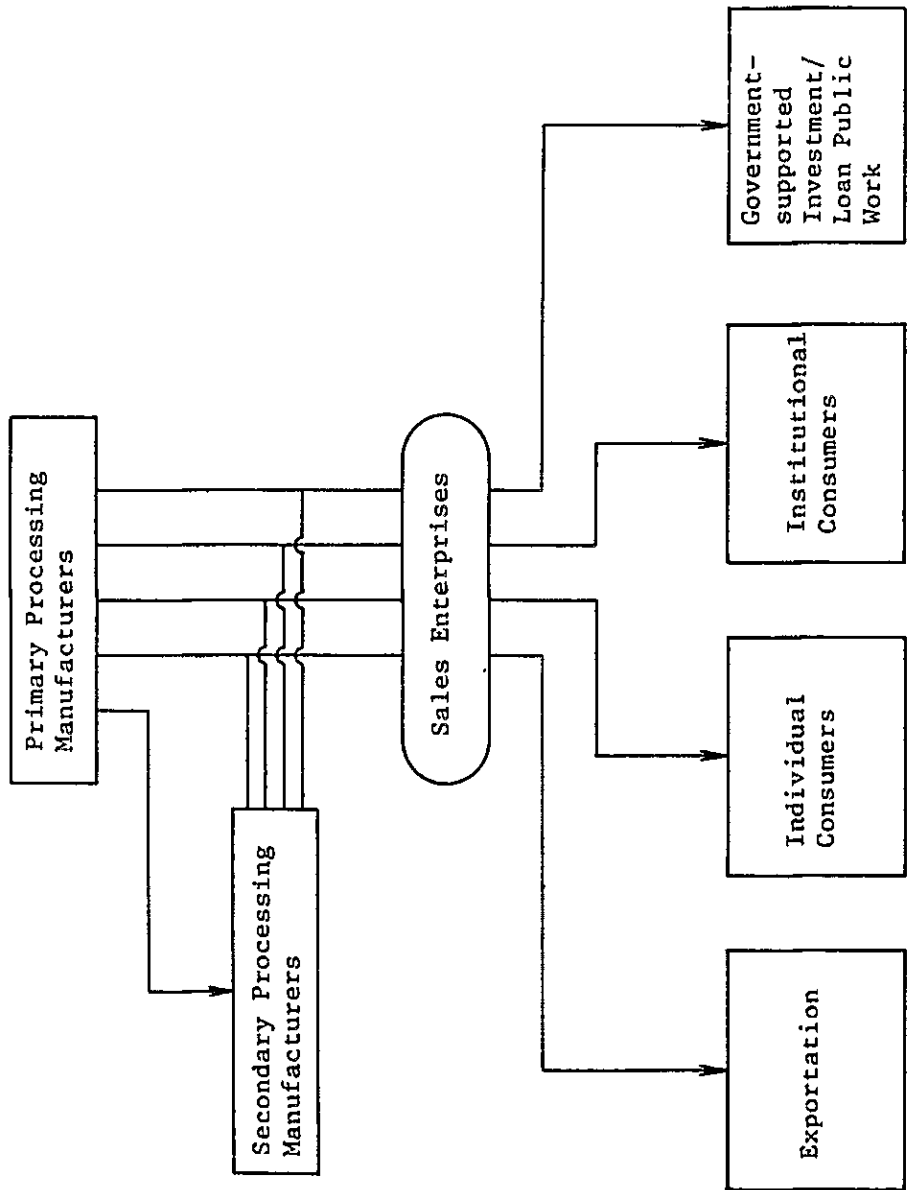
The basic structure of the external market is as shown in Fig. I-1-2. In this market, plastics materials are already turned into the form of the products which will be transacted in accordance with the supply/demand balance situation. The behaviour of the products is subject to various factors. At this stage, plastics is freed from the production process, and becomes subject to the economy as commercial commodities affected by the extent of demand and price. The features of the external market are as follows:

(a) Complexity of the production system

The production system of the enterprises in this market cannot be simply classified into the so-called three basic activities, i.e., the farm-out, order acceptance, and speculative production. The production system involved here is a complicated combination of various factors altogether functioning to form a flexible adaptability to the market situation. The fact that this market usually involves keen competition is due mainly to the simplicity of embarking upon the primary and secondary processing business. Therefore, for plastics processing enterprises, the affiliation with and organization of wholesalers and retailers become extremely important depending upon the type of the products they handle. The wholesalers and retailers in this case are therefore the key factors of the means of the distribution of the products to the external market.

(b) Keen competition with the existing products

The appearance of PVC pipes and PVC boards or plates in the market necessitates the acquirement of new installation techniques on the part of the plumbers and carpenters who have been handling iron/steel pipes, iron sheets, lead pipes, lead sheets, etc. At the same time, the furniture manufacturers will have to learn the new technique because of the emergence of melamine decorative boards in the furniture industry. New plastics packaging materials will give incentive to the converters and other consumers to acquire the knowledge and technique of modern packaging industry. Thus, plastics products will enter into direct competitions with the existing pro-



Tanks and Pipes for Factories,
 Parts for Electric Appliances,
 Vehicles, and Machinery,
 Building Materials, Civil
 Engineering and Construction
 Materials, Agricultural
 Goods, Daily-use Miscellaneous

Fig. I-1-2 Structure of the External Market for Plastics Products

ducts. At the same time, the plastics products will gradually or rapidly gain popularity while causing revolutionally changes in the installation and utilization techniques.

2. Role to be Played by the Petrochemical Industry in the Plastics Market Development

As discussed earlier, the plastics market consists of the internal market and the external market. However, when the term plastics market is used generally, it is often the case that the internal market is the subject of the issue. However, unless sufficient development of the external market is made, no meaningful expansion will be made in the internal market.

The development of the external market is usually carried out in the following three directions:

- (a) Development of the market by the processing enterprises themselves
- (b) Market development by the plastics material manufacturers or jointly by the materials manufacturers and the processing enterprises
- (c) Market development by the end users of the plastics products

Ambitious processing enterprises often induce commodity design and specifications from overseas. When necessary, they sometimes purchase technical know-how and/or producing facilities in order to turn out new product. They will also make close contacts with the distribution enterprises as well as the end consumers in order to develop new products geared to the needs of the market. However, such undertakings usually call for a considerable amount of research and development investment and monetary risk. It has been often the case immediately after the appearance of some products on the market, imitation products will closely follow to quickly bring the market into a confusion and deterioration. Thus, many processing enterprises become discouraged and eventually lose interest in engaging in the development of new products at their own risk.

The plastics material manufactures on the other hand will try to develop new processed products which are not as yet taken up by the processing enterprises in order to expand the market outlets of their own products which are plastics materials. The plastics material manufactures will also try to expand the sale of the already existing plastics processed products in order to improve the sale of their plastic materials to the market. Because the scale of operation of the materials manufactures is much larger than that of the processing enterprises, they have a higher ability to withstand the research

and development investment. At the same time, the materials manufacturers undertake the R&D activities for the purpose of selling their own products (plastics materials). By and large, the materials manufacturers are in a better position to undertake the investment for new market development for the purpose of ensuring the continuance of the sale of their products (plastics materials). Since processors are more experienced in processing of plastics than plastics materials manufacturers, it is often necessary to call upon the processors' cooperation when the plastics materials manufacturers intend to develop new products.

The end consumers sometimes develop plastics products out of their own necessity. There are cases in which the end consumers, often manufacturers of certain products, embark upon in-plant production of the plastics products because of the insufficiency in the external supply system of the necessary plastics products, or out of the necessity for stream-lining the production line at their factories.

The same will apply in the case where the end consumers happened to be governmental agencies or organizations. In the case of Japan, there is an example that the Telephone and Telegraph Communications Corporation developed telephone equipment or city communication cables. A number of PVC pipes, sheets, and boards are being consumed in Japan in projects supported by governmental financing.

In order to accelerate the development of the external market, it is necessary that the above-mentioned three policies be implemented and promoted independently. Of the above, (a) and (b) are deeply related to the problems of fostering the processing industry, while (c) may be promoted by the plastics materials manufacturers or by certain governmental agencies through contacting the end consumers for the purpose of developing the demand.

3. Policies to be Undertaken by the Government

There seems to be three groups of policies for developing the market for plastics products.

The first group of policies pertain to the recommendations geared to the establishment of an overall supply system in the petrochemical industry.

The second group involves the policies concerning the industrialization of the country as a whole, while the third group encompasses those policies which are particularly relating to the market development for Iranian petrochemical products.

3-1 Policies for establishing an overall supply system

At present, the Japanese petrochemical industry is achieving a production the scale of which is second only to the U.S.A. It is likely that such a position was gained as a result of political formulation of an overall supply system capable of supplying high-quality and low-cost products in a manner directly linking the upper-stream and the downstream operations of the petrochemical industry.

When large-scaled petrochemical complexes were constructed in Japan, a cost of the production was invariably higher than the level of international price. The major reason was that Japan was inexperienced in operating petrochemical complexes. A same circumstance may arise in the case of the petrochemical complex by IJPC in Iran. When the Bandar Shapur project actually implemented and started production, it is very likely that the prices of their products will be higher than the international level. In such an event, the Japanese Government undertook the following policies in order to attain the internationally competitive level for the Japanese petrochemical products within the shortest possible time:

- (a) Provision of low interest loans from the Japan Development Bank for installing plant and equipment facilities
- (b) Approval of specially short-term depreciation of the production facilities
- (c) Approval of introduction of foreign technology
- (d) Establishment of import duty barrier concerning the products for which the domestic production have been achieved
- (e) Exemption or reduction of the extent of corporate taxation
- (f) Exemption of import duties for necessary machinery and equipment
- (g) Incentive system for encouraging exportation of the products
- (h) Financial assistance and preferential treatment in taxation concerning the investments made by the enterprises in the field of research and development

As a result of these policies, the upper stream industries of the Japanese petrochemical industry were able to attain sufficient international price competitiveness within a few years of starting commercial operation. It is true that the preferential provisions have been given to the Bandar Shapur petrochemical complex by the Iranian Government. However, it seems desirable that the protective policies be further

given to this project. It is impossible to develop the downstream industries themselves and the market for their products without having well-designed protective policies by the government for the upper-stream petrochemical industry.

The establishment of the overall supply system does not simply mean the establishment of steady supply sources of raw materials for petrochemical industrial operation. The fostering of the downstream industrial operations to further process the domestically produced raw materials is absolutely indispensable. Further discussions on this point will be made in the following chapter.

By the establishment of the overall supply system in the petrochemical industry, high-quality and low-price products may be made available for the Iranian national economy. Only on the basis of such a supply, will it be possible to further develop the market outlets for the products. In this sense, the early establishment of the supply system is of the primarily important condition for the eventual market development.

3-2 Policies concerning industrialization

In formulating fostering policies for the petrochemical industry, it is indispensable to conduct the analysis of the current status with the highest possible accuracy. For accurate analysis, reliable data are necessary. The problems pertaining to the collection of accurate data are not limited within the framework of the petrochemical industry in particular. This issue should be discussed within a larger framework of the industrialization of the country as a whole. The task of developing the plastics and synthetic rubber processing industries within the Iranian national economy therefore closely relates itself with the issue of substantialization of these foundations for industrialization. Among these bases, one of the most important is the industrial standardization. Although the Iranian Government has already tackled the problems of standardization, it has been revealed during the course of the recent field survey that there still are a considerable number of products of undesirable quality in the field of plastics molding/processing operations. When it is necessary to repair plastic piping work, the identical diameters cannot be readily made available in many cases. These instances seem to imply that the standardization in this industry has not yet been completely effected. Such a circumstance will deteriorate the reliability of plastics products, and if left uncontrolled, a poor image of the plastics industry will eventually be created. This problem will evidently present a great disadvantage to the development of market outlets for the Iranian domestic plastics products.

3-3 Policies concerning market development of plastics products

The rapid development of the economy of Iran since the Oil Crisis presents certain similarity to the situation prevailing in Japan during mid-1950 period. When the national economy is developing in such a speed, the potential demand for the plastics products is tremendously high. This point has been fully clarified by the recent field survey.

However, the conditions of the Iranian national economy today are, at the same time, remarkably different from those prevailing in Japan during the 1950s. The points of difference may be summarized as follows:

- (a) Problems pertaining to human resources
- (b) Problems pertaining to the extent of social capital substantialization
- (c) Problems in the commodity distribution structure
- (d) The extent of accumulation of know-how on which to base future technological developments
- (e) Extent of the progress of industrialization

The economic foundation of Iran seems to be much weaker than the Japanese economy during the 1950s for establishing a new sector of industry. When it is necessary to proceed with the building of the petrochemical industry while standing on a comparatively weak economic foundation, it seems necessary to carry out the fostering and market development policies with a much stronger intensity than in the case of Japan. As some examples of the more intensive policies, following points may be worthy of consideration:

- (1) Purchase of petrochemical industrial products by the government for use in public projects

In the case of agriculture, necessary fertilizers are subsidized by the government so that the farmers can procure them cheaper than market price. In order to further rationalize the agricultural production of the country and further to increase the agricultural productivity, it is recommended that the Iranian Government purchase such materials as plastic pipes for irrigation work, plastic film for agricultural-use, etc. so that these items may be supplied to the farmers charging low prices. A similar system seems to be also applicable to the water pipes for city water supply and sewerage system construction, or in other government-sponsored public projects.

- (2) Control over the importation of plastics products and materials which can be substituted by plastics

Control over the importation of raw material plastics alone will not be sufficient to protect the domestic market. Therefore, the import license covering all the plastics products should be placed under the jurisdiction of the petrochemical enterprise. At the same time, certain import regulations should be effected concerning products made of materials which can be substituted by plastics.

(3) Necessity for popularization of plastics products

It seems also necessary to carry out an effective campaign of public relations and advertisements through mass media concerning the advantages, functions, roles, etc. of plastics products. The recent field survey revealed a fact that the knowledge of general Iranian population on plastics products is not yet sufficiently high, although the value of the products is beginning to be recognized by the economic sphere of the country. Since it will present difficulties in market development under such a circumstance, it is strongly recommended that much more intensive and encompassing educational campaign be carried out through mass-communication media.

The necessity for bringing up such recommendations as mentioned above, and further of actual implementation thereof is supported by the fact that the objective of developing the Iranian petrochemical industry is not limited to the eventual fulfillment of the domestic demand for the products. It is taken here as a prerequisite that the petrochemical industry of Iran will in the future become able to carry out exportation of products. While American, European, and Japanese petrochemical industries have already accomplished full development after spending a long time, it would be extremely difficult for Iran to quickly develop the petrochemical industry to be able to export the products. It is obvious that such a goal cannot be attained by following usual methodology of development. It seems possible that effective and realistic support by the governmental administration will eventually turn out exportable products from the Iranian petrochemical industry.

II MARKET DEVELOPMENT

1. Several Aspects of the Demand Development

Depending on the case, there are several elements to be considered when intending to develop demand for plastics products. The elements are:

(1) Improvements in national economy

First of all, the basic point is the general improvements in the national economy resulting in increase in demand for all types of materials.

(2) Price competitiveness

Plastics materials themselves are often in competitive relationship with products made of other materials. Therefore, it is necessary for plastics products to be superior in terms of prices (including both the price level itself and the application cost of the products).

(3) Streamlining of the commodity distribution

The distribution of the products as commodities should be improved in such a manner that the necessary items can be surely, easily and inexpensively made available.

Of the above, (1) through (3) are general requirements so to speak and are basic issues for those plastics products which have already been manufactured domestically and gained considerable extent of market.

(4) Development of the consuming industries

If products are being imported in plastic containers (e.g., cosmetics, food products, etc.), domestic demand for the plastics containers will probably be generated if the contained products are domestically produced. Domestic developments in household appliances, automobiles, and other various machines will also result in enhancement of plastics products in the form of the parts and components of these products. Popularization of frozen food will generate demand for plastics materials in the distribution stage in such forms as heat insulators, containers, etc. Along with the intensification of the commodity distribution systems, the need for plastics foam will also be generated.

(5) Current importation made in the form of plastics products or synthetic rubber products

There are several items in this field the domestic production of which can now be justified economically in

terms of quantity. Some examples in this respect are PP woven bags for containing fertilizers or chemicals, belts for belt conveyors, some of electric wire and automobile or vehicle tires. The impediments at present upon domestic production of these are higher prices of the products when produced in Iran, or in many cases the extremely low product prices thereby discouraging the incentive for domestic production. In many cases, the production of some items is still technically difficult. Governmental restrictions on giving approval on investment for embarking upon domestic production of some items may constitute some problem. In this respect, it seems necessary for the government to encourage necessary transfer of technology from overseas, or establishment of joint venture enterprises, together with governmental administration of establishing adequate price control.

- (6) Utilization of materials other than plastics due to technical reasons

In view of the currently adopted construction method in Iran, PVC pipes seem to be more suitable than the conventionally used steel pipes for indoor/outdoor drainage pipes, etc. in view of installation technology. (In installing steel pipes, lead welding is necessary. Due to the lack of proper technique on the part of welding operators, lead often intrudes inside the pipe, thereby causing blocking of the flow.) The major reasons for low popularization of PVC pipes at present in Iran are the lack of recognition of the performances of PVC pipes on the part of plumbers, construction design engineers, etc., and the difficulties in manufacturing pipes and joints.

Therefore, the necessary actions to be taken here are as follows:

- (a) Propagation of information concerning PVC pipes destined to the construction industry
- (b) Proper training of the plumbing engineers
- (c) Observance of quality standard and dimensional standards in order to create trust in the application of PVC pipes
- (d) Adoption of color-identification of the pipes in order to avoid confusion and misinstallation

A higher level of production technology will be required in producing water feeding pipes and hot water feeding pipes. In this area, it therefore seems necessary to study the feasibility of technology transfer and establishment of joint venture companies together with formulation of market development strategy. The adoption of plastic pipes for transportation of natural gas

is another important item for future studies. The utilization of PP oriented films, LDPE lamination films, etc. are also important subjects.

(7) Necessity for developing the utilization of plastics products

Employment of agricultural plastic film (for use in building green houses, tunnels, etc.) and the adoption of SBR for high-speed motorway paving have already been carried out in many countries with a great success. In the case of this type of projects, it is necessary to start with the evaluation of the expected results obtainable by adoption of the plastics products. Establishment of pilot farms and experimental application seems indispensable, and the future propagation activities should be based on the results obtained therefrom.

Market development is affected not only by individual element mentioned above but more than one of the elements combined.

For instance, in case of irrigation-use PVC pipes, the expansion of area under irrigation (4) and the development of the piped irrigation and utilization of plastics pipes therein (2), (6) and (7) will be altogether necessary.

2. Policies Concerning the Demand Development

2-1 Methods for demand development conventionally adopted in Iran

Questions were asked of a number of plastics and synthetic rubber processors concerning the methods they are adopting in terms of demand development during the course of the present survey. The replies for the most part indicated that the processors were taking a rather imitational or passive attitude towards demand development. The reply very often stated that they produced certain items after seeing the popularity in the Bazar, or in compliance with the requests made by market or the consuming industries. One of the typical examples of this attitude is the recent boom in commercializing carrying bags and garbage bags using HDPE films.

On the other hand, there are some examples of self development as follows:

- a) The manager or the successors of certain processing manufacturers visited Europe or the U.S.A. to work for similar companies to gain new commodity knowledge and adopted it in their production after returning to Iran.
- b) The managers of processing enterprises visited plastics trade fair or processing enterprises in Europe or the U.S.A. to look for prospective items which could be

manufactured within the reach of their technology.

Without having ample capital and technology, such methods of demand development based on imitation have been a natural behaviour for the Iranian plastics processing manufacturers. In most of the cases visited, the demand development was almost entirely undertaken by the president of the processing enterprises.

One of the problems which is contributing to a low incentive for new product development is quick imitation by competitors immediately after development of new products. Because of the sudden emergence of a number of followers, the value of the new product will rapidly deteriorate, so that the pioneering efforts of the developer fail to bring about any profit. Information obtained at Tehran Plastic Co. indicates that PE buckets made by injection molding which were developed by Tehran Plastics some five years ago is now sold on the market at half price because of the emergence of imitation products by other manufacturers. This compelled Tehran Plastics to reduce the production of the buckets.

Another impeding factor upon the demand development concerns itself with the trend of in-plant manufacturing of processed plastics products by the consuming industries themselves. For instance, soft drink bottlers such as Mina Glass Co., Sasan Co., etc. are producing their own crates inside their factories. This has been greatly contributing to the apparent delay in the development of general-use plastic crates in Iran. The parts and components of electrical appliances and machines are for the most part produced by the machine manufacturers themselves such as Azmayash Ind., Co., etc. Together with automobile companies which import most of the plastic-made parts and components from overseas, these leading manufacturers have obviously been deteriorating the incentive on the part of the domestic plastic processing manufacturers for developing the production of these items.

Of course, the users of these plastic products will insist that Iranian domestic plastics processing manufacturers still lack sufficient technology to develop and manufacture the necessary items. At any rate, it is true that the conventional trend of demand development activities have been small in scale and intermittent in progress.

And besides, some manufacturer of plastics materials from Europe, the U.S.A., and Japan undertake the task of transferring technology and at the same time help to develop the market. For example, IEM (Irrigation Equipment Manufacturing Co.) produces 3 thousand tons of HDPE pipe in a year, and 100% of materials is procured from Hoechst of West Germany. The company Hoechst helps IEM not only in teaching manufacturing techniques, but also in training engineers for the installation of pipe by despatching engineers, and in making propaganda to the consumer of products. They hold seminars on HDPE pipe in Iran, half the expenses of which is said to be born by Hoechst.

2-2 Policies to be taken for developing the demand

Discussions were made in Volume III concerning the field-wise and material-wise demand forecasts, together with itemized products having strong prospect of future demand. As discussed in these parts, the future demand for most of these items are not on a linear extension of the present level. In other words, the demand here will not grow entirely naturally, but will develop as a result of considerable efforts exerted to bring about the actual growth. Therefore, the demand for these items must be developed into new fields of consumption.

In order to develop such new fields of demand, the necessary activities may be summarized as follows:

- (a) Intensification of public relations and propagations of information concerning the subject commodities in such a manner that they will be readily accepted in the new fields
- (b) Intensification of technical service activities for the elimination of technical distrust in plastics products which is forming a great impediment on the development
- (c) Compilation of basic technical data to support the service activities, together with standardization of quality and specifications in order to readily cope with new and large-quantity demands
- (d) Systematic and organized activities for encouraging and promoting the employment of plastics products by the consuming industries and related governmental agencies and organizations

These activities cannot be undertaken by individual plastics or synthetic rubber processing enterprises because of their limitation on manpower, time, and cost, thereby involving a great economic risk. Therefore, an effective and influential organizing body to assume the central role of these activities must be established.

In the past, plastics manufacturers or synthetic rubber manufacturers used to play the role of the organizers in Japan. The Japan Plastics Industry Association was formed by membership consisting of plastics processing companies, plastics manufacturers, and commodity distribution companies. In the synthetic rubber industry, the Japan Rubber Industrial Association was formed by the similar constituents. It must also be noted that effective support was given in technological research and development by governmental laboratories such as the Machinery Laboratories of the Bureau of Industrial Technology, Osaka Municipal Industrial Laboratory, etc.

In the case of Iran, formation of industrial associations is not as yet made in the plastics or synthetic rubber manufacturing sector. From 1979 onwards, when IJPC will start production, supplier of plastics and synthetic rubber should be the central body of such an organization to be formed in the future.

So far, the general task of the organizer was discussed. In the following, individual items of activities shall be explained in further detail:

- (1) Propagation activities aimed at the consuming industries

When developing new demand, the primary task is to let the potential consumer industries realize the existence of the products. For instance, agricultural-use film is currently used in only a slight amount in spite of the fact that the potential demand for this item is estimated to exceed 200 thousand tons per year*), for such applications as green houses, tunnels, irrigation water evaporation prevention, etc.

The reason for such a low extent of utilization of agricultural-use films with such a great extent of potential demand may be due partly to the high price of the commodity (Rial 78/kg for LDPE wide-width film); however, another important reason is the fact that the application of the films for green house and tunnels is not yet known by the farmers, and further that the house/tunnel method of cultivation is not popularized at all in Iran.

In other words, even if the farmers know of the existing of the films, they are usually not informed as to the method of building the green houses and tunnels, or do not know how to procure the necessary materials and components. As long as the farmers are not informed about these points, and therefore are ignorant about the expected profit in terms of yield available by utilizing green house technology, no demand for agricultural-use film will be generated.

As the means of propagation of information, actual demonstration seems to be more effective

*) : Only for flower growing industries in Iran, the PE film requirements for green house and tunnel is estimated to be about 40 thousand tons calculated on the basis of the current flower growing area of 121 thousand ha. In Japan, agricultural-use PVC film alone is consumed in the amount of 200 thousand tons per year.

than mass-media such as radio, television, newspapers, etc. Such demonstrations can be conducted for instance by utilizing a land of appropriate agricultural laboratories or opinion-leader farmers by actually building model houses and tunnels followed by question/answer sessions. As an auxiliary equipment, 16mm film may be prepared to be shown at village meetings, etc. In addition to these on-the-field activities, extension centers should be established at the villages to display or explain the advantages of film-based cultivation technique, together with the introduction to manufacturers and procurement methods. Such extension centers should also have a function of despatching qualified demonstrators to the villages.

(2) Elimination of technical distrust concerning plastics materials

As a result of the above-mentioned propagation and promotional activities, the potential users will come to know the existence of the products, the advantages, and the application methods, thereby hopefully creating an incentive on their part to embark upon actual employment.

A serious impediment in this case is the anxiety on the part of the farmers concerning the performances of the agricultural-use films in such points as the weather resistance. In the case of PVC pipes, the potential users will naturally have some doubts as to the endurance of the pipe against the land pressure when installed underground. In order to eliminate such impediments, it is necessary to despatch touring trainer to render technical services. This technical trainer can be the same person as the demonstrator as explained in above (a).

In the case of PVC pipes, specialized knowledge will be required in the piping and installation technique, so that trained plumbers should be in charge of installation. Training on the PVC pipe installation technique must therefore be given to the plumbers who will actually be in charge of the work. For this purpose, it is necessary to foster technical service personnel who will be in charge of cooperating with the trainees on the field of pipe installation for a certain period.

(3) Compilation of the basic data

In order to cope with various questions which will be asked by the potential users in connection with the anti-weather performances of the film, etc.

as mentioned in above (2), it is absolutely necessary to thoroughly compile the necessary basic data.

For the most part, the preparation of such basic data will require a considerably long period of time until measurements and experiments are completed. However, it is fortunate that almost identical grades of resins to the planned IJPC resins have already been produced in Japan and ample data have been collected concerning the products made of such resins in actual application. It is therefore recommended that such Japanese basic data be obtained and modified by incorporating the local factor collected in Iran.

Such basic data should also include the economic advantages obtainable by employing plastics products over the conventionally used materials (e.g., weight reduction becomes possible by employing plastic crates instead of traditional wooden boxes, thereby reducing the transportation cost, etc.), or comparative data of the merit of two cases in one of which the plastics products are used and in other no utilization is carried out (e.g., the extent of cropping increase gained by using plastic films for green houses and tunnels, etc.), and other pertinent comparative data in terms of values.

In many cases, basic data are difficult to understand for the farmers. Therefore, full utilization of illustration or graphic explanation and other visual aid must be made for facilitating ready comprehension.

(4) Standardization of quality and dimensions of the products

Prior standardization of quality and dimensions of the products is indispensable in order to organize a number of small-sized processing enterprises to meet new and large-quantity demand in order to supply products of uniform quality and specifications.

In the case of PVC pipes, national standard should be established for each field such as irrigation, urban water supply/drainage, electric wire conduit pipes, etc. covering the quality and the dimensions. Only those products satisfying such standards must be produced and licensed to be placed on the market. By means of this provision, the users can always obtain stable quality and dimensions without feeling any uncertainty as to the technical compatibility.

There is no doubt that the standardization of quality and specifications will greatly contribute to the generation of new demand.

(5) Contacts with users, governmental agencies and organizations

By implementing the activities as enumerated (1) through (4), the materialization of great new demand will be made possible. In some cases, the sales efforts of individual processing enterprises may materialize actual demand; however, the organizer should also assume an important role of negotiating with large users, governmental agencies and organizations for official adoption of the products. The activities of this field consist of the following points:

(a) Encouragement of adoption of plastics and synthetic rubber products in public work

Negotiations with the Ministry of Road should be made to materialize incorporation of SBR into the blending specification of asphalt to pave high-speed motorways.

The blending of SBR will considerably enhance the strength of the pavement. The employment of PVC pipes or PE pipes for new development of agricultural land should be suggested to the Ministry of Agriculture. Suggestions should also be made to NIOC concerning the adoption of plastic pipes as natural gas transportation pipes. Such suggestions will be readily accepted by these authorities and users if the basic data as mentioned in above (c) are completely prepared, and the standardization mentioned in above (d) is properly enforced.

(b) Joint development of new products and new application together with the users

Pars Oil Co. and Shell of U.K. are jointly developing the employment of plastics materials to make containers of automobile-use lubricants. Materialization of actual demand will no doubt be made with success if the resin manufacturers give advise to the users concerning the best suited plastics, grades, shape of the containers in view of the molding technology during the course of research and development. The resin manufacturers is also in a good position to introduce the best qualified processing manufacturers upon completion of the development of the products.

It is highly likely that users also feel strongly about the joint development with resin manufacturers concerning new products and new application. Usually, development of this type require a long period of time. Therefore, resin manufacturers should install a section to be in contact with the potential users at all times concerning the availability of joint development efforts.

- (c) Propagation and information feeding to art designers and engineering designers

Commerical art designers and engineering designers should be well informed about the availability of suitable materials such as indoor water feeding/drainage pipes, flooring materials, wall papers, etc. used as construction and housing industries. Art designers and engineering deisgners usually have strong authority as to the selection of the materials, and users usually listen carefully to the recommendations made by the designers. At the same time, the designers are responsible for selecting the most suitable materials. This signifies that the designers need thorough data on plastics materials to warrant their recommendation.

- (d) Coordination of the parties concerned

There would be no problem if there are one plastics processor, one dealer, and one user. Because of the existence of number of companies and parties involved in this industry, various problems are apt to take place concerning the supply method, pricing, etc. Proper coordination of the relationship among these parties for the avoidance of unnecessary problems and troubles is important indirect activities for developing future demand.

The policies concerning demand development as discussed so far is collectively called the "demand-pull" method of marketing because the expansion of the demand for the processed products will trigger the expansion of the processing requirements, which will eventually generate demand for raw material plastics and synthetic rubber. This method is suitable to be applied to an industry in which the relative power of the processing enterprises is still weak such as in the case of the plastics and synthetic rubber industries.

III FOSTERING STRATEGY FOR THE PLASTICS PROCESSING INDUSTRY

1. Foundation for the Plastics Processing Industry

The following are the points considered to be the basic foundation for the existence of the plastics processing industry:

- (1) The prices of the raw materials and products must be reasonable and stable.
- (2) Stable supply of raw materials of stable quality must be made available.
- (3) The market outlet for the products must be stable.
- (4) The supporting industry must be well developed.
- (5) Procurement of necessary fund for investment must be readily available.
- (6) The production technology must be either already introduced or developed.
- (7) High-quality labour force must be available.
- (8) Infrastructure must be well prepared (utilities, transportation, communications, housing, etc.).
- (9) The management ability must be high.
- (10) Protective measures in taxation must be available.
- (11) Necessary technical and managerial assistance must be made available from the raw materials and production facilities suppliers.

As stated above, the numerous products in the plastics processing industries have countless uses and are manufactured by various methods. The manufacturers of these products are usually small, unlike the suppliers of their raw materials, such as the petrochemical industry, or the consumers of their products, such as electric appliance manufacturers and automobile makers. Therefore, before the establishment of such small and various manufacturing companies, it is necessary for the government and official organizations, as well as the resin-maker, to be aware of that full support and cooperation are prerequisites for their firm establishment. Even though these companies have ability and put forth great effort, it may be almost impossible for them to succeed without help and cooperation from the government and material suppliers.

2. Fostering Strategy

The policies to be formulated for the promotion of the processing industry, in view of the overall conditions of the current environment in Iran, must be closely geared to these prerequisite conditions for wholesome existence and development of the industry. An illustration in this respect is made in Fig. III-2-1.

Table III-2-1 shows the current status of Iran concerning the basic conditions which are the foundations for the existence of the plastics processing industry as discussed in the foregoing.

Although this illustration may give an impression of over-comprehensive as an actual promotional policy for the plastics processing industry of Iran, it is still true that these provisions are entirely necessary.

(1) Stock points

The most important action to be taken here is the stream-lining of the transportation for the supply of the plastics raw materials. Iran has a vast land area, and the geographic distance between the petrochemical industrial areas (Abadan, Bandar Shapur) and the major plastics materials consumption areas (Central Province surrounding Tehran) is more than 1,000 km. Mashad in the northeast is more than 2,000km away. Other important town such as Isfahan, Tabriz, etc. are also located far away from the plastics materials production center. The land transportation routes for plastics materials are now under severely tight conditions both in view of road availability and vehicle mobility because of the fact that all the importation into Iran must be unloaded at Ports of Khoramshahr or Bandar Shapur both located in southwestern part of the country from where the cargoes are transported to various destinations by land.

One of the reasons that plastic processing manufacturers for holding inventory of raw materials for several months to half-year operation, is due to the tightness of the land transportation availability. Along with future growth in the consumption amount of plastics products, and when Iranian domestic plastics materials are produced by several hundred tons every day at the petrochemical industrial plants, the present system of land transportation will not be capable of meeting the transportation demand. Some change must therefore be made to the system of commodity distribution and transportation. One of the means to cope with this problem is the installation of stock points between the producers and consumers, i.e., between the petrochemical industrial plants and the factories of the processors. The processors will make trips to these stock points to procure necessary raw material

Table III-2-1 The Present Status and the Future of the Plastics Processing Industry in Iran

Basis	Present Status	Future	Countermeasures
A. Market for Plastics Products	<p>a) Amount of demand is described in Volume III.</p> <p>b) Market development and popularization of application is not carried out sufficiently.</p> <p>c) Competition of plastics products with other products: Plastics products compete with products made from other materials (steel, paper, wood, etc.) only in price.</p> <p>d) Competition with imported goods: Imported plastics products are woven bags, electric wires and cables, etc. There is no competition with imported goods.</p> <p>e) Import restriction: It must be examined by a committee in which manufacturer take part in.</p>	<p>Petrochemical enterprises should diffuse application technique and develop market of plastics products.</p> <p>For this purpose, establishment of technical service laboratory is necessary.</p> <p>It may also be possible to let processors develop market when they introduce technical know-how from foreign countries or establish joint ventures.</p>	<p>To fix a definite system</p> <p>To fix a technology-introducing project</p>
B. Prices of Raw Materials and Products	<p>a) Domestically produced PVC: Though material is expensive, products are inexpensive.</p> <p>b) Other plastics materials: Imported comparatively inexpensively</p> <p>c) Price of products: Ceiling price is set by price control system.</p>	<p>When IJPC will start production, almost all plastics materials will be obtained domestically. Price of plastics materials is desired to be comparable with international price. Price of products should be competitive with products made from other materials.</p> <p>Price of products should be set on the basis not only of weight but also of added value (including design, function). To lessen the effect of resin price on plastics materials take part in the processing industry, as an example.</p>	<p>To make pricing policy clear concerning plastics materials.</p>

Basis	Present Status	Future	Countermeasures
C. Supply of Materials	<p>a) Quality and grades: Concerning PVC which is domestically produced now, there is not enough variety of grades. Packing bags of PVC powder sometimes broken during transportation and weighing is uneven at each bag.</p> <p>b) Distribution: No delivery service for processor is offered. Concerning imported materials processors have inventory for 4 to 6 months, because of insufficient condition of harbour, customs clearance, inland transportation, and because it takes long time to follow the necessary import procedure.</p> <p>c) Payment system for the purchase of materials is in cash or on credit.</p>	<p>In domestic production of plastics materials, establishment of supply system with enough variety of products for each application field is required. For the supply of materials it is necessary to place stock-points.</p>	<p>To make a materialized plan for stock point (location, capacity, system)</p>
D. Manufacturing Technology	<p>a) Production facilities: Many companies have newly imported equipments. On the other hand, some companies in Tehran have superannuated and old-fashioned equipments with low productivity.</p> <p>b) Production technology: Most of processors do not take quality of the products into consideration sufficiently. In general, processors would depend on the fields like housewares, thick films (evaluated in weight) in which high technique is not necessary and they obtain high profitability than on the fields for which high technology is required.</p> <p>c) Usually they depend on the technical services of foreign material producers or the machine manufacturing companies. Consuming industries of plastics products sometimes introduce foreign processing technology of plastics parts.</p>	<p>Demand for plastics products for the industrial use is increasing. It will become necessary to develop technology to produce products which meet industrial standard.</p>	<p>To set solid standard. To authorize factories where standardized products are produced. To establish an organization for instruction and development of processing technology in NPC.</p>
			<p>To appoint foreign-technology-introducing company</p>

Basis	Present Status	Future	Countermeasures
	<p>d) Though a few enterprises have new production facilities, they do not utilize them properly.</p> <p>e) Some production facilities have become superannuated and old-fashioned. There are some enterprises which are not rationalized yet in Tehran.</p>	<p>Flexible management of restrictions on industrialization in the vicinity of large cities is required.</p>	<p>To study application of restriction on land.</p>
E. Labour	<p>a) Labour, especially skilled labour, is lacking in general.</p> <p>b) Productivity of labour is low.</p>	<p>Additional labour required for the development of processing industries is estimated to be 6,000 persons. Labour saving technology should be adopted (Automation of material supply and product handling). Establishment of processing industry on the place where labour is obtained constantly and training of skilled labour should be required.</p>	<p>To establish an organization to carry out rationalization of existing companies</p> <p>To work out a schedule for training</p>
F. Support for Technical and Managing Activities	<p>a) Private companies are taking initiative. There is neither public supporting system nor mutual supporting system among companies.</p> <p>b) There is a guide system of administration by IDRO, however, no plastic processors are under the guidance of it.</p>	<p>Draw up a program for fostering administrators in co-operation with IDRO. To let them settle down in their companies.</p>	
G. Management	<p>a) They are eager to produce consumer goods, for they can sell them profitably. They do not prefer to produce materials for the industrial use.</p> <p>b) There is neither cooperative connection nor joint investment between the processors and consumers</p> <p>c) No joint venture enterprise of plastic processing industry. Automobile and household electric appliances industries do plastics processing in their factory.</p>	<p>Joint enterprises with consuming industry should be established. If necessary, NPC should take part in them. (e.g. Supporting of and capital investment to pipe-manufacturing companies by Ministry of Residence and Cities and NPC.)</p>	

Basis	Present Situation	Future	Countermeasures
	<p>d) Only a little administrative ability and technology, which are necessary for a development of demand, are introduced by foreign capital. Sometimes applications for such introduction are refused.</p> <p>e) Those which introduce technology from European countries and joint ventures have, in general, high level of technology. Some companies with managers having an experience in European processing companies have excellent management system and high level of technology.</p> <p>f) 50% of stocks must be publicly offered. Foreign capital is limited within 25% of the whole investment.</p>	<p>Positively introduce technology and capital from foreign companies (pipe for water and warm water supply, OPP film, lamination of films, high pressure cable, communication cable, pallets).</p>	
H. Investment	<p>a) Investment: Generally financed by own capital.</p> <p>b) Payment for the purchase of equipment: In many cases payment is made after selling products, in case of machine manufacturer generally on credit.</p>	<p>Necessary sum of capital for a new investment is estimated to be about 250 million dollars, which is hard to be financed only by own capital. For the plastic manufacturer loan system of long-term and low-interest by banking facilities like IMDBI, ICB, DIB becomes necessary. It is necessary to study to have loan for the purchase of machine.</p>	<p>Government (Ministry of Industry) should work out a definite policy of appropriating domestic and foreign capital.</p>
I. Tax System	<p>a) Income tax: Income tax is not imposed for 5 years on the manufacturers located in the area more than 120 km away from Tehran.</p> <p>b) Term of tax-exemption for manufacturers in remote region is longer.</p> <p>When a manufacturer residing in Tehran moves more than 120 km from Tehran, it is exempt from taxation for 12 years after the removal.</p>	<p>The favourable taxation system should be maintained.</p>	

Basis	Present Status	Future	Countermeasures
	<p>c) Import duties: Raw material resin is exempted from import duties. Import duties on plastic products is 40 to 100%. Upon them Commercial Benefit Tax (C.B.T.) is imposed.</p> <p>d) Import duty on processing machines is 10%. Upon it C.B.T. of 25% (an ad valorem duty) is imposed.</p>	<p>Restriction on imports of plastics products If the domestic prices of raw material resins are expensive, import duties should be imposed even on the resins which are not produced domestically. Processing machine should be exempted from import duties.</p>	
J. Infrastructure	<p>a) Operation rate often decreases because of the lack of electricity (power stoppage).</p> <p>b) Rationalization of companies in Tehran and its environs (in 120 km) is not carried out at all because of land-restriction in large cities and their environs.</p> <p>c) As the industrial estates are not fully cultivated, many companies do not want to remove.</p> <p>d) They endeavor to improve roads, but domestic transportation system is not good enough.</p>	<p>Proper location of industries according to the kinds of processing products (consumer goods in large cities, goods for agricultural use, for industrial use)</p> <p>OSSI and IBI should make a model industrial estate for plastic processing in co-operation with some organizations such as IDRO, IMDBI.</p>	<p>To work out a definite plan of industrial estate</p>
K. Supporting Industry	<p>a) Coloring industry: PVC compound is produced, but dry color, master batch, and coloring pellet are imported.</p> <p>b) Metal-mold industry: There are some small-scaled metal-mold factories which produce simple metal-mold. But this industry is dependent on import, so it takes much time to obtain goods after placing order.</p> <p>c) Manufacturer of processing machine: There are some manufacturing companies but products are comparatively expensive and not good enough in quality and durability. Main machines used there are imported. Stabilizer, additives: Imported except for DOP.</p>	<p>Possibility of establishment of coloring factory increases as production of resin and domestic market for the products expand. With the establishment of coloring factory they can meet consumer's demand smoothly. It is desired for NPC to introduce foreign technology or to establish a joint venture.</p> <p>Metal-mold for injection molding and compression molding should be manufactured at a section of machine tool manufacturing factory. NPC should help manufacturing them as a resin manufacturer.</p>	<p>Definite plan of establishing coloring-factory and metal-mold factory (place, capacity, etc.) should be worked out and feasibility study should be carried out.</p>

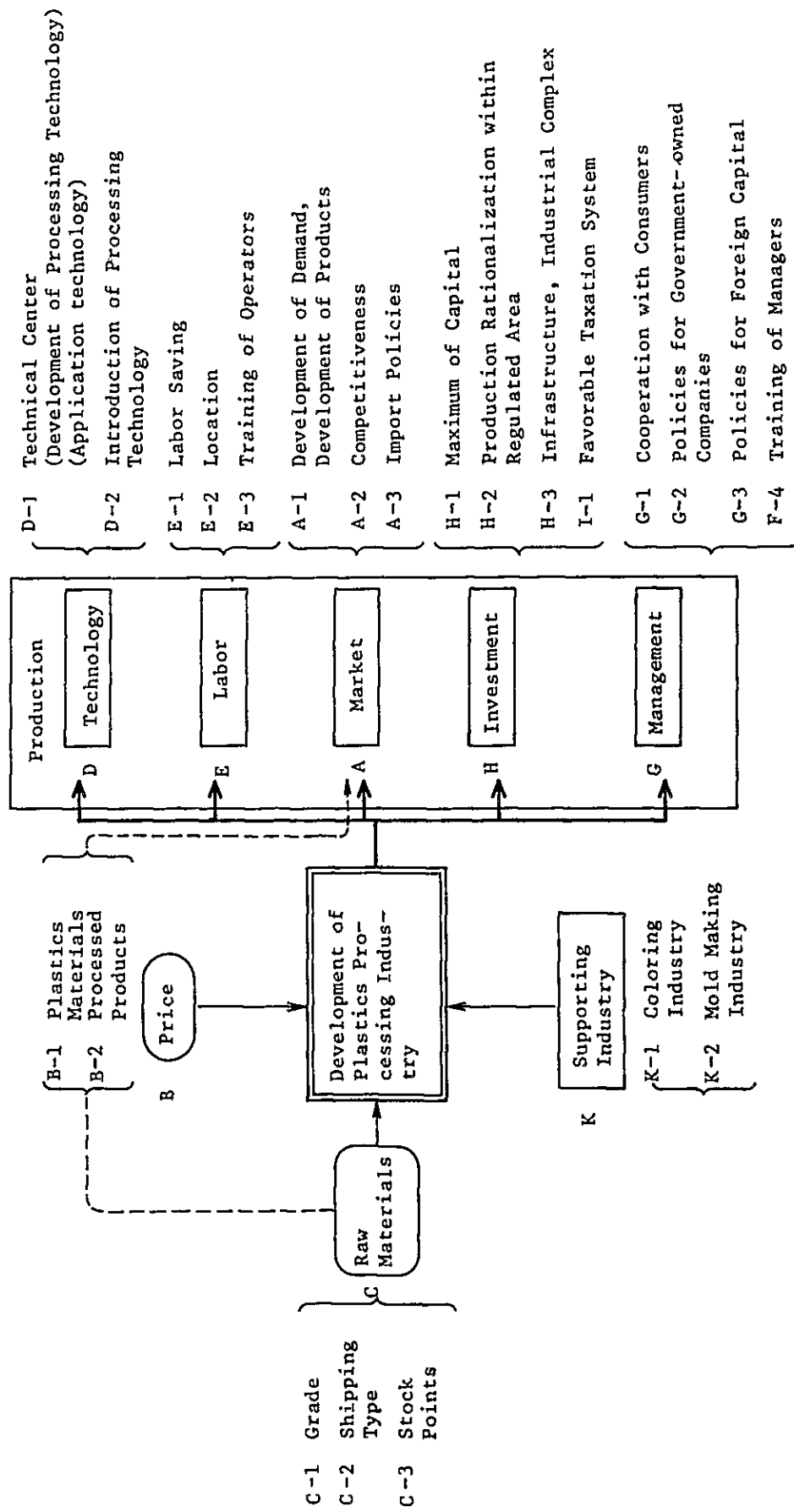


Fig. III-2-1 Procedure of Development of Plastics Processing Industry in Iran

resins. The plastics materials produced every day at the petrochemical plants shall be transported to the stock points every day and shall be stocked in accordance with the types and grades.

The major functions required of the stock points are as follows:

- Proper storage facilities of raw material resins
- Proper communications with the sales department of the resin producers in order to effect smoothly the supply of the materials to the processors
- Communications with the sales department and with the plants concerning the inventory and replenishment information
- Scheduling of transportation including trucking, etc.

Therefore, such a stock point will eventually have the functions of a distribution center of the materials.

As candidate sites proposed for stock-points, remote places such as Tabriz, Mashad, and Rasht are pointed out other than Tehran and Isfahan where many processors are located. Qazvin and Qom, which are industrial areas near Tehran, should also be pointed out as important sites to be proposed as stock points.

- (2) When the demand of plastics and synthetic rubber products expand preparation and application of industrial standard becomes indispensable.

Quality control and inspection system are necessary to enable the processing industries to produce products which correspond to industrial standards.

A system of appointing factories which produce industrial standard products may be a good policy to promote plastics processing industry when it is conducted effectively. On the part of the consumers of plastics products, it is necessary to oblige them to consume industrial standard products and to enhance their consciousness of the importance of the quality of plastics products.

- (3) Flexible operation of zone restriction measures and promotion of rationalization of existing plant

It is necessary to undertake a policy within the framework of which the rationalization projects of enterprises within the restricted zone can be carried out under certain conditions. Successful implementation of such a policy will simultaneously enable orderly urban development and wholesome promotion of the petrochemical industry. As to the conditions for such

rationalization projects, the following may be pointed out:

- (a) The present number of the employees must not be increased (in order to prevent population increase within the zone).
- (b) The increase in the electric power consumption should not exceed the increase rate of productivity.
- (c) Industrial water consumption increase must be limited within a certain range by employing recycling systems, etc.
- (d) The market outlets of the products should be found mostly inside Tehran.
- (e) The products shall be those which are necessary for economic development and for the promotion of the welfare of the general public, and also those which are expected to show supply shortage in the future.
- (f) The production facilities to be introduced for the purpose of rationalization should have high productivity and shall not be obsolete in design and performance.
- (g) The management of the enterprises must be rational so that the results of the streamlining of the producing facilities and management will be conspicuous.

If the rationalization and streamlining of processing enterprises qualifying these conditions are promoted, it will be possible to strengthen the power of individual enterprises of the processing industry. Those enterprises which cannot fulfill these conditions will be gradually eliminated from the industry.

In order to carry out this system, understanding and positive cooperation of the following governmental authorities are absolutely necessary. The petrochemical enterprise's effective negotiations with these authorities is highly desired:

- Ministry of Industry and Mines
- Ministry of Housing and Urban Development
- Plan and Budget Organization

- (4) Measures to be taken for the solution of labour shortage problems

On the basis of abundant oil revenue, Iran is promoting an overall economic development. Therefore, unlike many

other developing countries, labour shortage is felt quite strongly not only for skilled workers but also unskilled workers. The stability of labour force is not very high. The number of skilled worker is especially small, thereby forming a serious bottleneck in improving production and expanding producing facilities.

It is estimated that the additional labour force requirements by 1985 in the plastics industry of Iran including the synthetic rubber industries will be approximately 6,000.

The actions to be taken in coping with the labour force shortage is as follows:

(a) Labour saving provisions

The labour saving provisions are necessary not only for newly constructed or expanded factories, but also in already existing enterprises. An important point in the introduction of labour saving policy is the streamlining of transportation systems of raw materials and products, and rationalization of manual work, rather than hurried employment of highly-automated and high-productivity machines. The labour saving should therefore be carried out from a total process viewpoint rather than modernizing some specific stage of the production flow. Especially in the case of processors operating in and around Tehran, the implementation of labour saving provision seems absolutely necessary. It seems necessary to negotiate with the governmental office in charge of urban factory restriction administration so that streamlining and rationalization of factories operating in this district will be officially approved.

(b) Site selection of processing operation towards districts with abundant labour force

In regard to the site selection for the processing operation in view of labour force availability, it should be noted that the degree of labour shortage varies from place to place. The labour shortage is especially conspicuous in Tehran area and Isfahan area both of which involve extremely active commercial and industrial activities. Because of religious custom of the people, mobilization of potential female labour force is highly difficult in one area and comparatively easy in the other. Negotiations with governmental authorities should also be made as to the orderly construction of factories in agricultural areas where the availability of steady labour force is high, except in the case of producing

products mainly consumed in large urban areas. Such site selection for the industrial operation also meets the governmental policy of regional development. Negotiations with the governmental authorities should therefore be based on the request for the substantialization of the governmental development of infrastructure in local areas.

(c) The training of skilled workers

A specialized training course for the plastics industry is installed at Karaj Vocational Training Center. This course should be expanded to other vocational training centers. The curriculum of industrial vocational highschools should also include lectures and exercises concerning petrochemical industry and plastics industry. In order to implement these training programs, experienced trainers will be necessary. It is possible to invite engineers and skilled trainers from developed countries for this purpose.

The graduates of these training courses should be fully mobilized for the highest effects at various private enterprises so that they can receive on-the-job training. A system for this after-care must be established. It is also necessary to formulate certain incentive arrangements so that the trained workers will continue to have the aspiration for improvement.

Another important problem here is the training of managerial personnel. The present survey revealed that there were a great difference between two enterprises producing similar plastics products when one company has qualified persons as managers and plant supervisors. When the basic policy of the management is sturdy and knowledge and experience of the key personnel as plant managers are adequate, the management and administration of such an enterprise were rational, healthy, and active without creating any serious problems. Most of such qualified administrators were trained personnel by working in the past for the European or American companies where they actually experience the techniques of operation control of factories. The number of such persons is still extremely small. Simultaneously with the training of skilled workers, it is also impreative to develop through education such middle management personnel under systematic programs in order to multiply the number of the high-quality managers. As one of the practical methods for implementing these programs, it is recommended that the middle-management training program should be formulated and

promoted in cooperation with IDRO. Other methods recommended here are systematic despatchment of the middle-management trainees to join overseas companies for the purpose of training, or establishment of the on-the-job training system within joint-venture companies.

A point of higher importance is the after-care provisions for the trained persons. The stability of these trained personnel must be assured so that they will stay in the same companies for a long time.

(5) Measures to be taken for promotion of investment

A considerable scale of new investment for plants and facilities is necessary in order to drastically increase the production capacity of the plastics processing industry in order to cope with the forecast growth of the demand. The conditions enabling the investment are identical to the fundamental conditions for the existence of the processing industry as discussed earlier in this chapter. Discussions in this section shall center on the investment fund.

The investment made so far in the Iranian plastics processing industry was mostly made within the framework of enterprises' own fund. In order to cope with the anticipated capacity increase in a drastic degree and to implement various rationalization and streamlining plans, the investment requirements will amount to an enormous degree. The estimated investment requirements for new investment by 1985 amounts to as much as US\$250 million. It seems rather difficult to accommodate all the fund with the enterprises' own capital. Borrowings from both domestic and international banks will be absolutely necessary. Strong negotiations by the petrochemical enterprise and administrative guidelines by the government is desired to be given to the following banks so that they will take positive and progressive attitudes towards financing of the Iranian plastics processing industry:

IMDBI (Industrial and Mining Development Bank of Iran)

ICB (Industrial Credit Bank)

DIB (Development and Investment Bank)

It is understood that the interest on bank loans from Iranian commercial banks range from 14% to 15% p.a., and the private financing institutes are collecting interests higher than the bank rate. It is necessary therefore that long-term and low-interest credit should be expanded by the above-mentioned institutions for the benefit of the plastics processing industry. Practical measures must be taken in

expanding the sources of the finance by for instance accepting bank loans from foreign banks for the procurement of plant machinery and equipment.

(6) Infrastructure

The indispensable items for the development of the industry are electric power generation stations, electric power distribution network, substantialization of road and transportation systems, preparation of other utilities, etc. In this section, problems concerning the urban area factory construction regulations will be discussed in view of industrial site selection. The regulations concerning the construction of factories around Tehran and Isfahan give quite severe effects upon the plastics processing industry. Adequate preparation must be made by the authorities for the evacuation of the existing factories from the zoned areas and for the installation of their new factories elsewhere. Another important point here is the rationalization of the operations of the factories still operating inside the zoned area.

(7) Fostering of supporting industries

The coloring industry and mold manufacturing industry are the supporting industries which should be fostered in Iran for the moment. The quantity of sub-materials such as stabilizing agents, etc., is small, and the specifications of the introduced technology of such materials are different from each other. Therefore, it is better to import them. Such materials mainly belong to products of fine-chemistry, and for the production of them, high technology and development of wide range of chemical industry in the whole country are necessary.

Therefore, it is a better policy for Iran to receive supply of these materials from the developed countries.

Regarding the processing machines some are already built inside Iran. Iran is in a good position to comparatively easily import the latest producing facilities with sufficient after-sales servicing. The processing facilities made in these developed countries are superior not only in the performances, but also in labour saving in many points. Although ultimate domestic production of the processing facilities is desirable in a long-range prospect, it is still more advantageous to import necessary machinery and equipment until the level of the development of the Iranian machinery industry gains another step forward.

(a) Development of the plastics coloring industry

For the most part, plastics products are tinted

in many different colors. Technology of coloring is as shown in Fig. III -2-2. At present, both master batches and colored pellets are being imported from Europe and the U.S.A. For plastics coloring operation, it is necessary to have an ample degree of flexibility to meet the likes and dislikes of the consumers. This is the reason why the promotion of the Iranian domestic plastics coloring industry is necessary. The most important technique in this industry is the color matching technique. It is impossible for individual plastics processors to master this technology. It is therefore to higher advantage that a separate enterprise be established to exclusively engage in the production of coloring pellets. NPC which is to be the resin supplier should carry out the introduction of foreign coloring technology, or the production of master batch and coloring pellets may be carried out by the petrochemical enterprise under joint-venture arrangement with a foreign enterprise.

(b) Development of the mold manufacturing industry

In a broad sense of the term, the "mold" includes the dyes, and the molds for injection molding, compression molding, and blow molding. As far as dyes are concerned, these are manufactured by the extruding machine manufacturers as one of the parts of the machine itself. The molds for blow molding operation can be manufactured comparatively simply by ordinary machine shops. The problems exist in the production of molds for injection molding and compression molding operations. The molds in these operations are called the "molds" in the narrower sense of the term, and usually these molds are made by specialized mold manufacturers.

The basic technology required of the manufacturers of these molds are the specialized technological abilities in handling metallic materials, heat treatment, plating and precision machining. Other industries employing molds are press fabrication industry (for automobiles, household electric appliances, etc.), the die-cast industry, etc. In view of the nature of the manufacturing technology, manufacturers of the molds should be established within the framework of machine tools manufacturing enterprises as one of their departments in which the manufacturing of molds for plastics industry as well as for the other industries should be carried out. This arrangement is quite rational in the operation and also will contribute to the development of the related

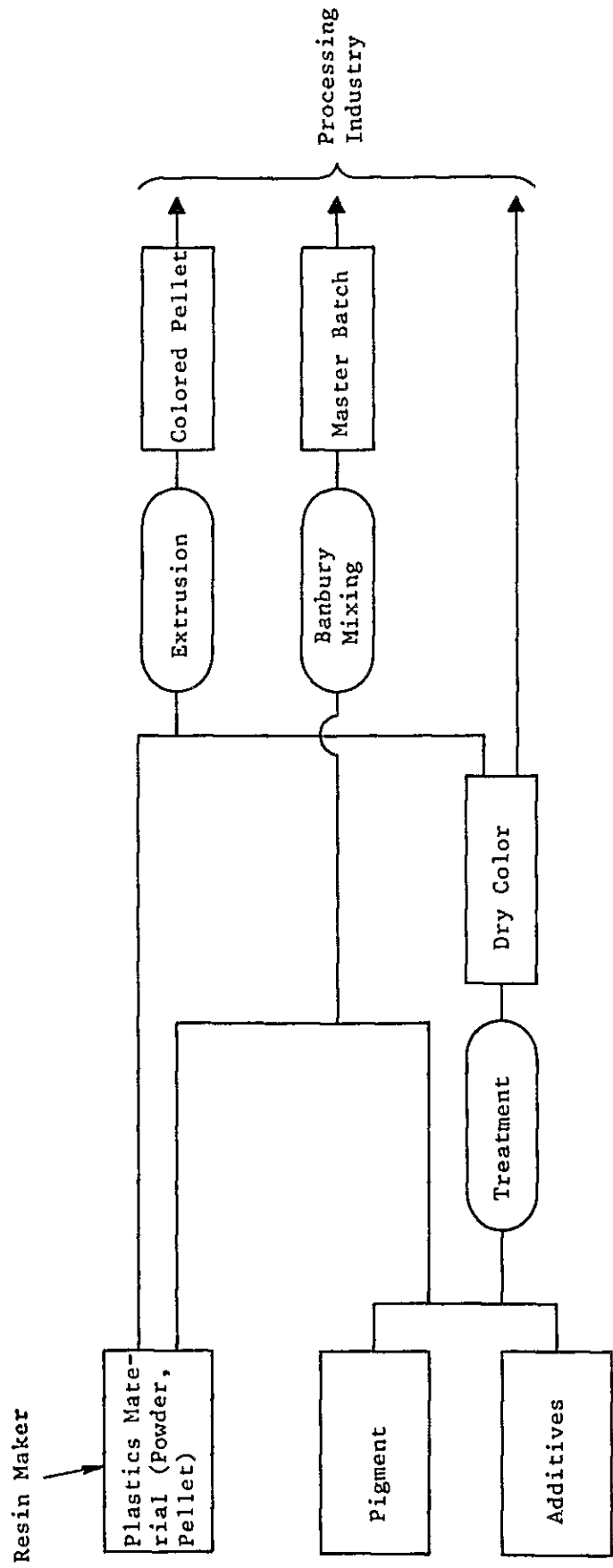


Fig. III-2-2 Coloring Plant

industries other than the plastics processing. In view of the position of NPC as the leader of the plastics processing industry of Iran, NPC should support the establishment of such a mold manufacturing enterprise, and shall feed necessary technical information as the material supplier.

3. Projects Requiring Investment

3-1 Plastics processing industry

This chapter elaborates on countermeasures in processing industry concerning each field of products. Table III-3-1 shows the product-wise summary of the above-mentioned. However, we summarize them again from the viewpoint of fostering processing industry and investment.

- (a) Those which are enjoying ample demand at present, so that immediate decision upon further investment is necessary:
 - a) Woven bags for fertilizers and plastics materials
 - b) Electric cables for high voltage transmission and communication
 - c) Belts and hoses for industrial use
- (b) Those requiring further studies as to the necessity of investment in accordance with the development of demand:
 - a) Crates for agricultural products and tools
 - b) Plastic tiles and flooring rugs
 - c) OPP films
 - d) Lamination films
 - e) Pipes for water/hot water supply
- (c) Those needing extension of application technology, propagation activities towards consumers, and other promotional activities for development of demand
 - a) Agricultural films
 - b) Pipes for irrigation and underdrainage systems
 - c) Indoor drainage pipes
 - d) Pallets
 - e) Blow bottles as industrial chemical containers

Table III-3-1 Product-wise Resin Usage, Existing Condition, Prospects and Countermeasures

Products	Resin	Purpose	Existing Conditions, Prospects	Countermeasures
1. Packaging film	FVC	A. General purpose	Capacity will increase in proportion to the natural increase of consumption.	Propaganda to consumers. Introduction of technique or establishment of joint venture. Propaganda to consumers and marketing are necessary. Spread of technology Introduction of laminator
	LDPE	B. OPP	Not produced at present (Cellophane is imported.)	
	HDPE	C. Lamination		
2. Woven-bag	PP	A. Agricultural products	Operation rate of existing plant has to be increased. No need of new plant	Decision on investment for promotion of domestic products consumption is urgently necessary. Introduction of new injection molding machine.
		B. Fertilizer	Imported bags are used at present.	
3. Sundry goods	FVC	A. General purpose	Capacity will increase in proportion to the natural increase of consumption.	Introduction of new injection molding machine.
	PP	B. Footwear	Rationalization of old facilities is necessary.	
	HDPE	A. Indoor electric wire	Manufacturers already exist. Capacity will increase in proportion to the consumption increase.	
4. Pipe	FVC	B. Drain pipe	No production at present	Technical instruction to users and development of consumption by propaganda are necessary. Upgrade of products and improvement of production system are necessary by introducing technology of processing and its utilization. Development of consumption and establishment of new manufacturers are necessary by joint venture or technology induction. Standard must be established.
	HDPE	C. Water supply pipe, Warm water supply pipe		
		D. Cable conduit	Large potential demand	
		E. Natural gas feeding pipe		

Products	Resin	Purpose	Existing Conditions, Prospects	Countermeasures
5. Plastic tile	PVC	A. Asbestos tile B. Soft tile	Necessary to increase production capacity in proportion to the natural increase of consumption	Propaganda to and development of consumers are necessary.
6. Crate	HDPE (PP)	A. Beer, Soft drinks B. Agricultural products C. Tool box, etc.	Capacity will be increased in proportion to the consumption increase of beer and soft drinks Production has taken place. Not used yet.	Development of potential demand is necessary. Investment must be considered in accordance with the demand development.
7. Pallet	HDPE	A. Transportation, Storage	Not used yet.	Development and study of consumption by importation of products are necessary. Large injection molding machines must be introduced. Operation rate must be increased by adding some other products.
8. Blow bottle	LDPE HDPE	A. Detergent, Cosmetics B. Food, Industrial chemicals C. Lubricant	Manufacturers already exist. Production capacity will increase in proportion to the consumption increase. In-lining of bottle making and stuffing of food processing and industrial medicine industry have to be promoted. In-plant bottling process should be adopted. Not used yet.	Cooperative development with consumers.
9. Electric wire	PVC LDPE	A. Low tension cable B. High tension cable C. Communication cable	Manufacturers already exist. Production capacity will increase in proportion to the consumption increase. Imported at present. Joint venture with developed countries has to be promoted to introduce process know-how.	Plan of joint venture must be promoted to introduce production technology.

Products	Resin	Purpose	Existing Conditions, Prospects	Countermeasures
10. Parts for industrial materials	ABS AS	A. Parts for automobile B. Parts for electric appliances	Products are mainly for general consumption. Capacity will increase in proportion to the consumption increase.	In order to increase rate of domestic production of parts, subcontract producers must be brought up for the future rationalization of processing industry.

- (d) Those for which plant and equipment investment should be made in accordance with the increase of the demand in the existing markets
 - a) Daily-use miscellaneous goods
 - b) General-use packaging films
 - c) Indoor conduit pipes
 - d) Bottle crates

- (e) Those needing higher level of technology by either joint venture company establishment or technological transfer from advanced countries
 - a) Water/hot water feeding pipes
 - b) Cable conduit pipes
 - c) Natural gas transportation pipes
 - d) Electric wires for igh voltage transmission and communications
 - e) OPP films

As has been discussed in the previous chapter, an enormous amount of investment and labour force will be required in order to establish a sufficient processing capacity to cope with the growth in the demand. Table III-3-2 presents an outline estimation in this respect.

About US\$250 million of investment cost will be necessary for the implementation of machines and equipment by 1985, and 60% of the outlet will be for the imported machines.

The number of necessary labour force to meet the increase of processing capacity will be about 5,000. The figure is made on an assumption that the introduction of autonomous development takes place and it is necessary to educate workers to be skilled labourers.

In the case that the labour force cannot be obtained after this considerable amount of investment is made, the plastics resins, which are produced through utilizing the natural resource of Iran, will have to be exported, and imports of plastics products will fill the domestic market demand.

It will be influenced directly by the international market, and the expenses concerning exportation and importation will be wasteful. As has been discussed above, that comparison can be made between the effect of fostering processing industry and the expenditure for importing plastics products. The increased, additional value and save amount of foreign currency are calculated in the former case. Based on the

figures in Table III-3-2 a rough estimation is made and the results are shown in Table III-3-4. Here, we estimate the increase of additional value to be US\$23.4 million, US\$82.0 million and saving of foreign currency to be US\$20 million, US\$68 million in 1980 and 1985 respectively. Besides, raising profit rate in related consuming industry, reducing cost, development of industrialization on the national level, enhancement of technology will be achieved to a great extent.

Ethylene plant of Bandar Shahpur will start its operation in 1980 - 1981. In order to foster the processing industry, individual activities of processors are not sufficient. In Fig. III-3-1 a sample of project-schedule of investment for each field of product in processing industry is shown for reference. As plastics processing industry has a wide variety of products and manufacturers, it is difficult to have a generalized plan. This schedule, indicates the time allocation, namely what should be done at first, what takes how much time, and so on.

Table III-3-2 Estimation of Future Investment Requirements and Labor Force for Plastics Processing Industries in Iran

	1977	1980	1985
Demand for Plastics (1,000 ton) (HDPE, LDPE, PP, PVC)	146	202	344
Processing Capacity Requirements (1,000 ton) (On assumed 60% operational rate)	243	337	573
Additional Capacity	-	94	236
Investment Requirements for Additional Production Facilities (million US\$) (US\$700/ton of resin)	-	65.8	165.2
Labor Force Requirements (Direct workers) (persons) (On assumed 40 ton/person)	3,700	5,100	8,600
Additional Labor Force (Direct workers) (persons)	-	1,400	3,500

Source: Table III-3-3

Table III-3-3 Estimation of Plant Cost and Number of Direct Workers for Plastics Materials in Japan

<u>Cost of Production Facilities (1975)</u>	
(1)	Average sales amount of one company: ¥759,278,000/year
(2)	Average raw material consumption: 1,546 ton/year (Average unit price of products: ¥491/kg)
(3)	Average value of machinery and equipment per enterprise (after 50% depreciation): ¥69,721,000
(4)	Value of machinery and equipment per ton (after 50% depreciation): ¥45,081/ton
(5)	Required amount of production facilities per ton (1971): (4) ÷ 0.5 = ¥90,000/ton
(6)	Escalation index of machinery price during 1971 and 1977: 2
(7)	Required amount of production facilities per ton (1977): ¥180,000/ton (US\$721/ton)
<u>Required Number of Direct Workers in Japan</u>	
(1)	Average number of direct workers per enterprise: 40
(2)	Average raw material consumption per enterprise: 1,546 ton/year
(3)	Processing amount per person of direct worker: 38.7 ton/year
(4)	Required number of direct workers per ton: 0.0259 person

Source: Production Cost Index of Small and Medium Enterprises (1977), Small and Medium Enterprise Agency of Japan

Annual statistics of plastics products (1976), Minister's Secretariat Research & Statistics Division, Ministry of International Trade & Industry of Japan

Table III-3-4 Increased Amount of Added Values and Foreign Exchange Saving brought by Development of the Plastics Processing Industries

(1) Increased Amount of Added Values

(Unit: million US\$)		
	1980	1985
(1) Increase of Depreciation	10.6	37.0
(2) Increase of Labour Cost (incl. Overhead) *	5.8	20.4
(3) Others (Repair cost, Maintenance cost, etc) ((1) + (2)) x 30%	4.9	17.2
(4) Interest, Profits (1) x 20%	2.1	7.4
Total	23.4	82.0

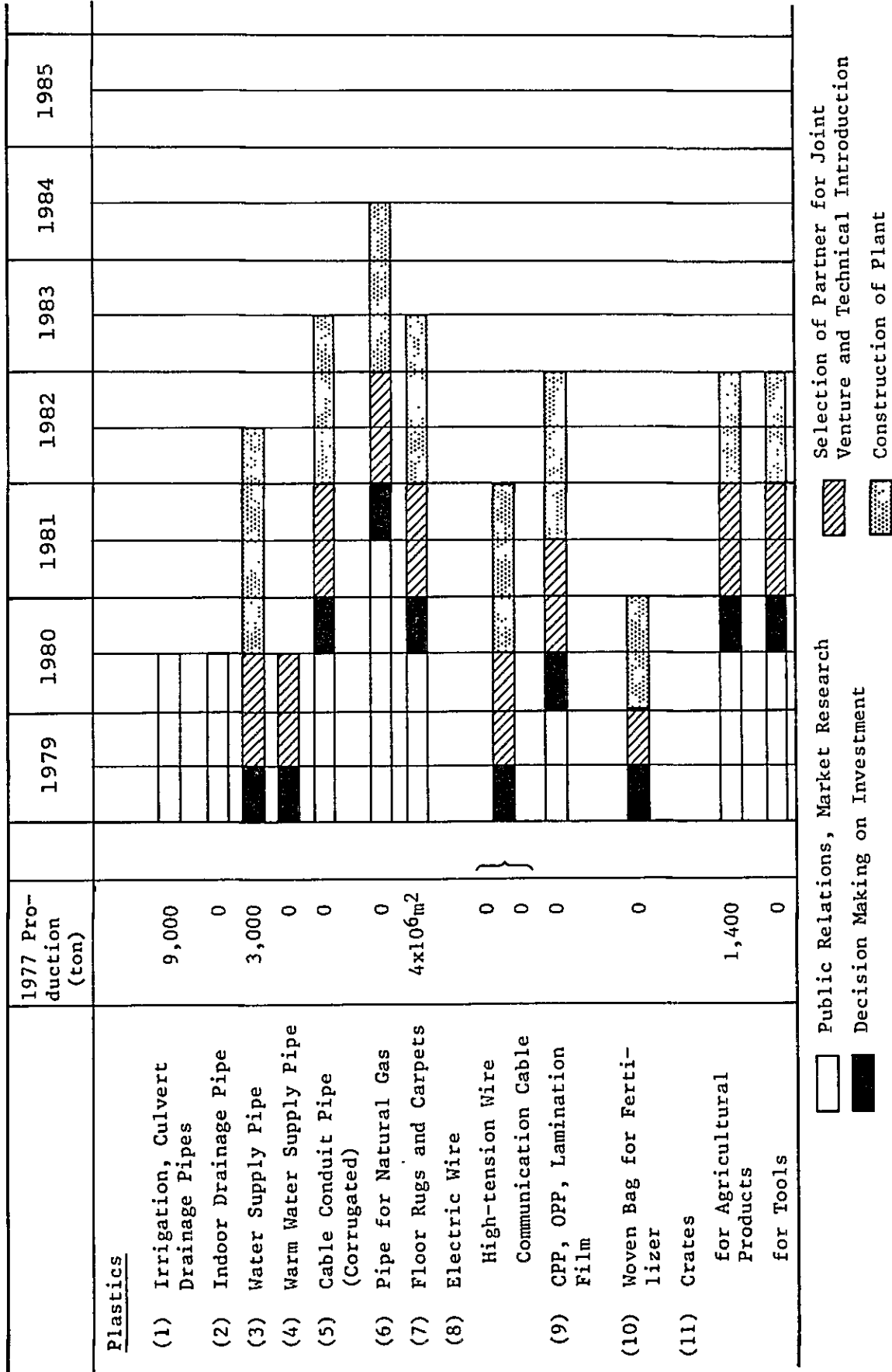
Note: *Labour cost here is estimated assuming that all employees are newly employed, so that it is considered to be the increase of added value. In the case where employees who had been working for other industries are involved, the difference between them will be net increase (or decrease).

(2) Foreign Exchange Saving

(Unit: million US\$)	
1980	1985
20	68

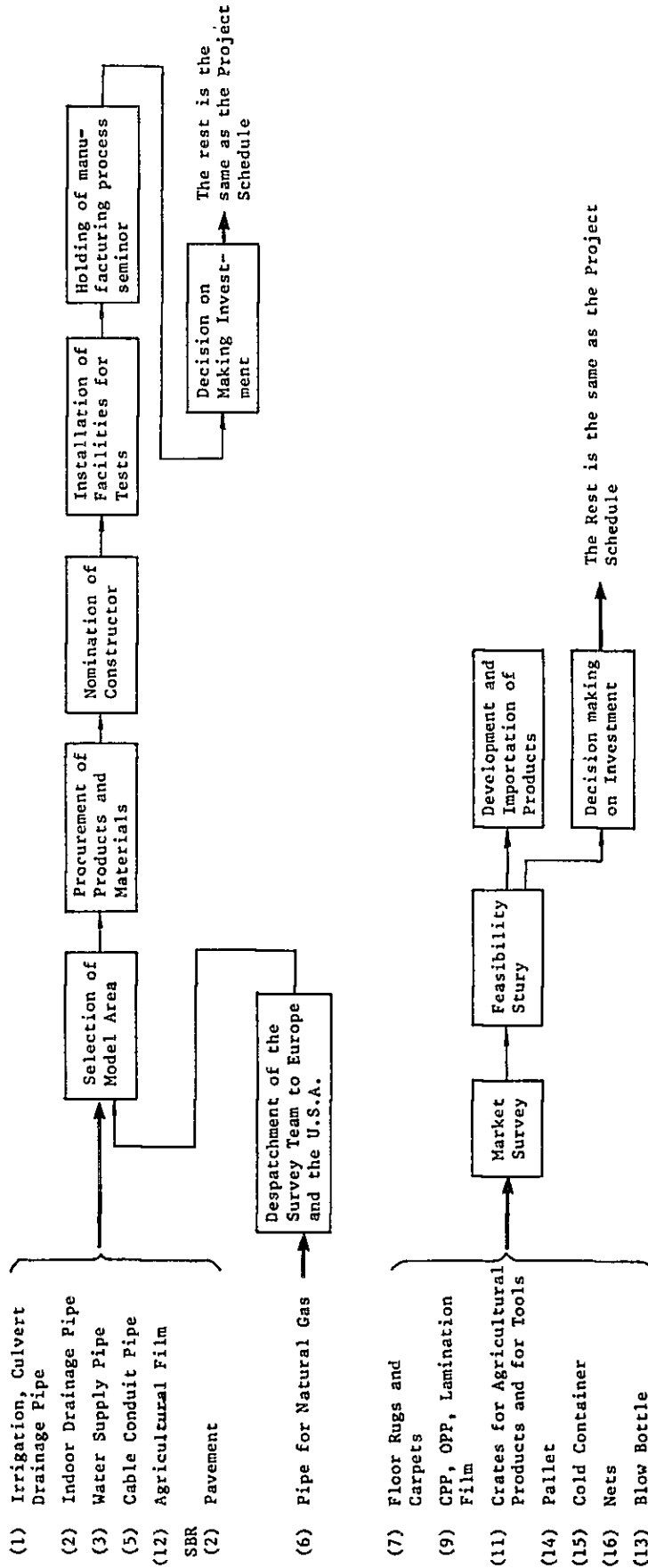
Note: The amount of the foreign currency saved is calculated by reducing the cost of depreciation for imported machines (foreign currency portion) from the increase of added values in Table 3.

Fig. III-3-1 Project Execution Schedule



	1977 Pro- duction (ton)	1979	1980	1981	1982	1983	1984	1985
(12) Agricultural Film	0							
(13) Blow Bottle for Shampoo	1,500							
for Liquid Detergent	200							
for Milk	1,000							
for Kerosene	600							
(14) Pallet	0							
(15) Cold Container	0							
(16) Nets	0							
(17) Industrial-use Parts for Automobiles	0							
for Electric Appliances	8,900							
Synthetic Rubber (SBR)								
(1) Industrial-use for Belt, Hose	400							
(2) Pavement	0							

Attached Contents of Project Execution



Followings are the products and industries in which a prompt decision making on investment is indispensable:
 (3) Water Supply Pipe, (4) Warm-Water Pipe, (8) Cable, (10) Woven-bag for Agricultural Use, (17) Industrial Parts,
 and (1) SBR Belt.

3-2 Synthetic rubber processing industry

(1) The investment requirements

(a) Tire manufacturing factories

The shortage in supply of tires in 1980 will be 50,000 tons and in 1985 172,000 tons if the rate of domestic production of tires is assumed to be 100%. In other words, by 1985, the investment requirements will amount to US\$344 million.

If the domestic production rate is 60%, i.e., if the production capacity is 160,000 tons in 1985, the balance will be 50 thousand tons, thereby calling for an investment amounting to US\$100 million.

Note: It is understood that the cost of a plant of 20 thousand-ton capacity in Iran built by Bridgestone-Iran Co. in 1974/1975 was about US\$40 million.

(b) Footwear manufacturing factories

The growth rate of rubber footwear was estimated to be 0% because of the prevalence of the plastic-materials-based footwear production. Therefore, the further improvements in the production of rubber footwear is deemed to be made mostly by the efficiency enhancement of the existing production, so that consideration here has been made only regarding the automatic injection installation of the DESMA class facilities.

(c) Factories for manufacturing industrial-use products

Recommendations are made here for early switch over to domestic production by means of either technology transfer or induction of foreign capital. It is assumed here that press machines and auxiliary facilities for manufacturing conveyor belts will be installed first of all. The cost estimated is about US\$2,800 thousand to cover five press machines by 1980, and about US\$4,250 thousand to install ten press machines by 1985. These figures have been incorporated into the investment requirements. Other plant cost requirements taken into consideration here pertains to extruders to manufacture rubber hoses.

(2) Labour force requirements

In the case of tire manufacturing factories as of 1977, the total production capacity amounts to 60 thousand

tons. The current level of production is 48 thousand tons calling for 2,700 workers. In the case of Bridgestone-Iran Co., 800 workers are required to produce 20,000 tons.

On the basis of Bridgestone-Iran Co.'s production system, the labour requirements for producing 40 thousand tons of tire is estimated to be 1,200 workers and in the case of domestic production, the number of labour force requirements are as follows:

Rate of Domestic Production (%)	1980	1985
60	2,850	4,800
100	4,800	8,400

Concerning the footwear industry, it is estimated that 4,000 workers are being required by the top four leading manufacturers (i.e., Melli, Bella, Wien, and Jam), while another ten footwear manufacturing factories are calling for an average of 200 workers. Therefore, the estimated figure in this respect is 2,000 workers. It is deemed that the footwear manufacturing based on both plastics and synthetic rubber will necessitate 7,600 workers by 1985.

Manufacturing of industrial-use products does not call for as much labour force as in the case of footwear production. It is assumed that full operation of producing facilities for these items will start some time around 1980. In Japan, 1,400 workers is called for to process 10 thousand tons of rubber on average. Therefore, this figure is taken as the basis to obtain 880 workers for processing 6,300 tons of SBR demand estimated for 1985. However, in view of the possible addition of the special rubber production and also of the ability difference between the Japanese and Iranian workers, it is assumed that the Iranian requirements in this respect will be twice as high as the Japanese counterpart, i.e., 2,000 workers. As a result, the tire industry of Iran will require 2,850~4,800 workers by 1980, and 4,800~8,400 workers by 1985. As far as the footwear industry of both rubber and plastics is concerned, the labour requirements are estimated to be 6,500 workers by 1980, and 7,000 workers by 1985.

As has been discussed earlier, the industrial-use product manufacturing sector is estimated to require twice the labour force of the Japanese average, i.e., 1,600 workers by 1980 and 2,000 workers by 1985.

IV SUGGESTED POLYMER SALES ORGANIZATION

Fig. IV-1-1 shows an organization which is necessary to actually execute the policies discussed in previous Chapters II and III. This organization consists of two departments, i.e., the Delivery Department and the Sales Promotion Department.

Concerning the organization and administration of the Delivery Department, the discussion concerning this part of organization is outside the scope of the coverage of the present survey. Special problems in this Department, however, are local sales offices and stock points. The local sales office should confirm regional information concerning delivery and inventory of the materials, thereby rendering services to the processors and end-users. At the same time, the Delivery Department is in charge of administration of the stock points.

The Sales Promotion Department consists of three sections as follows:

- (a) Consumer Service Section
- (b) Market Development Section
- (c) Technical Section

1. Functions of the Sales Promotion Department

The Sales Promotion Department has the main function of rendering services to the processors and effecting demand development under close cooperations of all the sections belonging to the division. The relationship among these sections and outside bodies may be illustrated as shown in Fig. IV-1-3.

1-1 Consumer Service Section

The major assignment of this section is to maintain close contacts with the processors. Close communications must be maintained by this section with the Market Development Section concerning the development of new products carried out by the processors, and with the Technical Section pertaining to any technical problems. The catalogues of the materials and products, as well as the handling manuals shall be produced by the Consumer Service Section.

1-2 Market Development Section

The main function of this Section is to maintain close contacts with the end users. However, concerning the test production of new products and preparation of test products to be placed on the market, the processors' assistance becomes necessary.

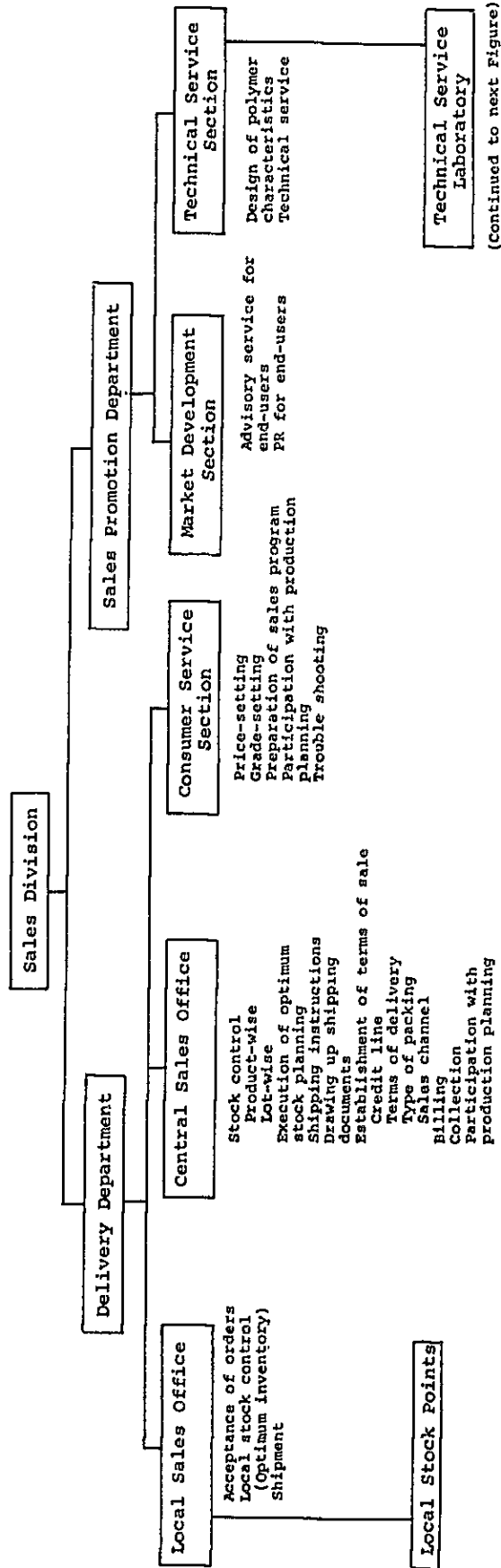


Fig. IV-1-1 Suggested Polymer Sales Organization for the Domestic Market

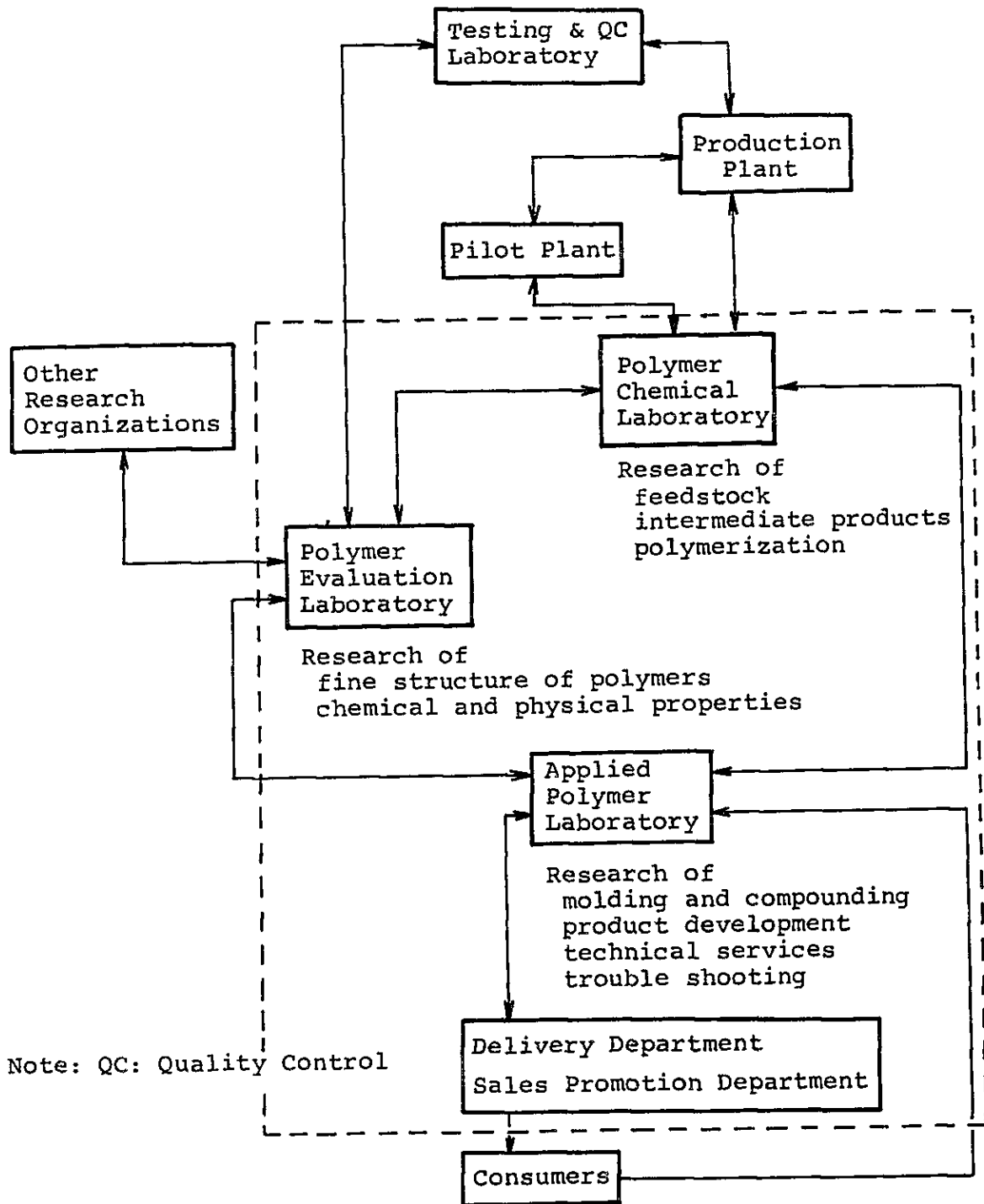


Fig. IV-1-2 Outline of the Research Organization of Technical Service Laboratory and Interrelation of Each Laboratory

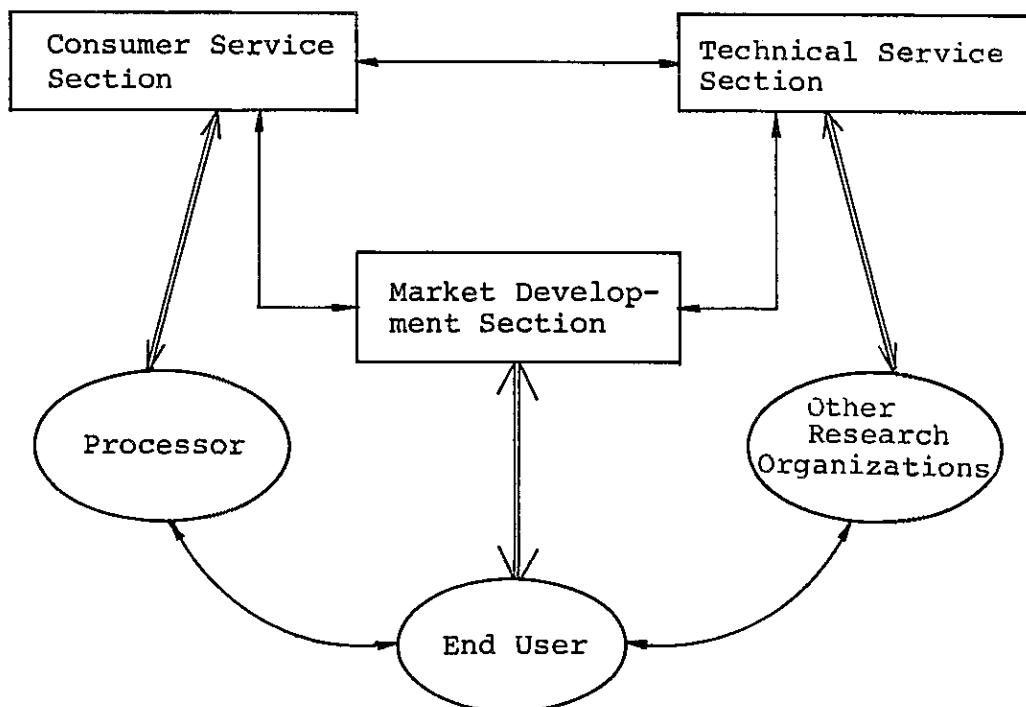


Fig.IV-1-3 Diagram of Sales Promotion Organization

Also, the technological development shall be undertaken in the form of a joint work between the Market Development Section and the Technical Section. One of the duties of this Section is to collect and analyze the domestic and international market information for further implementation of the results of the studies.

1-3 Technical Section

The major function of this Section is to participate in the technological development of the processors. In order to display the necessary function, this Section must have its own technical service laboratory (TSL). The Section must maintain close communications not only with the TSL, but also the research and development organizations of various universities and government agencies to seek effective cooperation. The Technical Section shall also cooperate with the Market

Development Section to carry out the demand development.

The assignments to be given to the TSL shall be as follows:

- (1) Technical evaluation of new materials
- (2) Study on the blending of materials
- (3) Technical evaluation of the products
- (4) Study on the processing technology
- (5) Tests and examinations of items in compliance with requests made by the processors and end users
- (6) Training of processing engineers
- (7) Tests for preparation of industrial standards in compliance with requests by governmental organizations or end users
- (8) Test and evaluation of products on the basis of the established standards

2. Cooperation with the Production Division

One of the most important duties of the Sales Division is to maintain close cooperative relations with the Production Organization. This close cooperation shall include prompt clarification of complaints and claims voiced by the processors concerning the quality of the materials and shall immediately transmit the information to the Production Organization for quick remedial action.

Another important function of the Sales Division is to clarify the needs felt by the market, and to develop the materials upon which suitable products to meet the needs can be produced. In order to carry out this assignment, the members of the Sales Division should visit the Production Organization at least once every month in order to hold a meeting with the production staff members of the factory of the organization.

In this Chapter, studies are made concerning the basic points of foundation for a sound plastic processing industry in general which compared with the current status of the Iranian processing industry. Then, discussions will be made on the necessary policies to further develop the plastics processing industry and supporting industries in Iran. On the basis of these points, a summary will be made on the product-wise future outlook and the desirable direction of development of the industry, and then execution schedule of the projects needing investment will be given.

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