IMPORT SUBSTITUTION
TRENDS, PROBLEMS AND PERSPECTIVE

[with particular reference to chemical industry]

THESIS

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CONTENTS

List of tables

PREFACE

Import substitution, as is well known, mainly arose out of : (1) rising domestic market with economic development, and (2) interruption in normal international trading relationships particularly due to war and balance of payment crippling crisis. Further, it is not merely an economic but a technical issue, too. Obviously, appropriate or relevant or intermediate technology results into augmented indigenous production and productivity. Besides, it has also an emotional aspect or tinge stemming from the elements of self-reliance and self-sufficiency as well as "Swadeshi" spirit.

Import substitution, in recent years, has been attracting urgent attention of international agencies like United Nations Conference on Trade and Development (UNCTAD), International Monetary Fund (IMF), European Economic Community (EEC), International Bank for Reconstruction and Development (IBRD) and General Agreements on Tariffs and Trade (GATT). Here, a special mention need be made as regards the United Nations Conference on Science and Technology for Development (UNCSTD) which is bent upon having a bid to solve growth problems. It covers a wide area pertaining to growth and development problems with regard to transfer of technology, regulation of the operations of

multinational corporations, new kinds of instrumentalities required to enable developing countries make better use of science and technology, increasing third world self-reliance, appropriate technology and energy problems and their implications for the third world. It would form a third world fund for 'high risk' research and development which would have $2,000 million at its disposal by 1985, reaching ultimately upto $4,000, as is being reported time and again in the press. It is further engaging the minds of economists, scientists, technologists, technocrats, bureaucrats, executives, politicians and others alike all the world over. The move to establish units like Polytechnology Clinics, District Industry Centres (DICs) to attain self-reliance and self-sufficiency has been gaining in over-riding significance. At the same time earnest endeavours are being made at dispensing with the monopoly multinational corporations with the gradual development of indigenous capabilities. In view of this, concerted efforts are being made for undertaking joint ventures in the third world countries. Mutually acceptable and beneficial economic, scientific and technical collaborations at the international level are being made. Import substitution has thus assumed global dimensions.

Import substitution plays a key role in the development of chemical industry. This industry embraces a wide range and variety of industries from the giant petrochemical and fertiliser complexes to the smaller and light industries as the paints and varnishes and is closely linked with other industries in the broad industrial spectrum of the nation. Significantly enough, it occupies the fourth position after iron and steel, engineering and textile industries. It has an extremely high rate of technological obsolescence. Being technological intensive, it has immense potential for fruitful application of indigenous technology. It is also knowledge oriented. It is worthy of note that, all things remaining the same, the indigenous, relevant, appropriate or intermediate technology is as good as, if not better than, the foreign, alien or overseas technology.

Import substitution extends the attendant advantages of development of skilled man-power, engineering and technical expertise, research and development capabilities, capabilities for capacity utilisation, for tiding over the foreign exchange crisis, for scientific and technological advancements, for generating employment opportunities and mobilising resources.

In view of the above, an humble attempt has been made to study in depth different aspects of import substitution as applied to the industry in general and chemical industry in particular.

In order to have an integrative and fuller perspective of the study on import substitution, various sources were explored, such as proceedings of seminars, conferences, books, articles appearing in different publications and also government publications. Several libraries in and around Pune as well as Hyderabad (AP) were visited for collection of data. Discussions were held with certain company executives to elicit their critical comments on the import substitution strategy in general and as applied to in their concerns in particular. As also, studied and considered views of a few academicians were sought.

The dissertation deals with import substitution pertaining to introduction, historical perspective, contemporary industrial scene and chemical industry. So also problems or implications of import substitution, empirical studies in select chemicals and emerging pattern of import substitution have been dealt with. In fine, conclusions are drawn in the light of the exhaustive study conducted and suggestions made.

Not merely grass roots, but national and international level growth and development of industry has been possible with the aid and adoption of the import substitution strategy. As the study and development are a continuous process, an humble attempt at critically appraising the impact of import substitution strategy has been made and its salient features highlighted. The study is confined to a quaternary period (1973-74 to 1976-77). In this a few instances have been cited that go a long way to emphasise the importance of the import substitution strategy and its potentials. The picture as to the import substitution strategy that emerges out is all-pervasive embracing variegated aspects of the overall economic system.

This study has been possible mainly because of spontaneous aid and advice that I received from various sources. First and foremost, my heartiest intellectual indebtedness is to my prolific guide Dr. M.S. GOSAVI, Ph.D. (Business Administration), M.Com., B.A., LLB, Sahityacharya, Principal, B.Y.K. College of Commerce and Director, J.D.C. Bytco Institute of Management Studies and Research, Nasik-422 005, for the dashing dynamism, immense encouragement and vigorous fillip imparted to me from

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(AMRUT K. KULKARNI)

I-CHAPTER

INTRODUCTION

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1.1. Genesis

The most phenomenal and salient feature worthy of note regarding import substitution is that it stems from the necessity - the mother of invention. When there is nothing to fall back upon, because of non-availability of certain items e.g. chemicals such as toluene, aniline and life saving drugs which were earlier imported from abroad, intensive as well as extensive research and development efforts were initiated to produce or manufacture them indigenously with the available resources.

The technical know-how thus developed helped converting difficulties into opportunities and then achieving self-reliance by way of substituting the goods, products or services that were hithertofore imported. Thus, import substitution has a technical aspect, too.

Further, it is a war-child, as it comes to the forefront because of the wars that inflicted severe constraints on smooth process of international trade.

It has an emotional tinge as well in that the sentiments run high and there is boycot of goods and services furnished by the colonial rulers (Britishers)

and indigenous ones are resorted to. The balance of payment crisis leads to the compulsion of adhering to indigenous production, thereby eschewing the dependence, to some extent, on other affluent advanced countries. Thus, it is interesting to note that there is ceaseless streamlining and the wheels of indigenous industries are geared and set in motion in full swing to dispense with the crutches of the foreign aid, credit or loan which are not without strings and thus accomplish, to the maximum extent possible, self-reliance - one of the primary avowed objectives of import substitution, an economic as well as a war product.

1.1.1. Import substitution - product of natural growth process

The motivation for import substitution varies from period to period as well as place to place. It is the product of the natural growth process, as is amply evident from the following analysis. As the domestic market grows with economic development, it is but expected that more domestic industries would spontaneously spurt or emerge to effectively meet the requirements, either with or without government support. In the circumstances, it goes a long way in

curtailing the cost of the economy of obtaining the goods and/or services in question. This results in substitution effect, to that extent, dispensing with the imports, depending naturally upon the conditions of market prevailing then.

1.1.2. Import substitution - product of economic necessity as also a "war child"

Further, besides being the product of natural growth process, import substitution has also been the product of economic necessity as a consequence of interruption in normal international trading relationships. The Great Depression of the 1930s and the Second World War severely disrupted the normal channels of communication of trade ensuing in the creation of "abnormally" alluring opportunities for the manufacture of domestic products or goods vis-a-vis manufactured ones from the other parts of the globe[17].

This necessity led the entrepreneurial class to establish their own capacity of production to meet the domestic demand getting over the constraints as inflicted on owing to the war, culminating in the indigenous production. This further led to the

introduction of controls on imports. Thus, Import Trade Control was first instituted in May 1940 as a war measure under the Defence of India Rules for conserving India's Dollar and hard currency resources, naturally boosting up the attempts at import substitution[15]. Immediately after the war in consonance with the object of developing the indigenous industries the interim Tariff Board was appointed to consider the items which could be given protection[4].

1.1.3. Definition

Various authors have defined import substitution in variegated manners with respect to different contexts. A few of them have been quoted here. According to Hal B. Lary, import substitution is a means of promoting industrial development[21]. P.B. Clark is of the view that import substitution is domestic production of what would otherwise have been imported[9]. Import substitution takes place if domestic production rises faster than imports, says Chenery[8]. Import substitution is, in fact, one of the strategies to check and control import leading to self-reliance, defines Blake Robert[6]. T.G.K. Charlu propounds that scarcity of foreign exchange, acute paucity of non-project aid and

unfavourable balance of trade have resulted in import substitution[7]. G.L. Bansal has stated that import substitution is a function of development and planning[2]. H.N. Gupta indicates that the concept of import substitution has evolved in India out of a crisis - the crisis of foreign exchange and therefore it is essentially a strategy to cope with our unfavourable balance of payment[16]. D.N. Dey has put forth that import substitution is the hidden element in India's industrial development and development plans[10]. Ahamad Jaleel is of the opinion that import involving the development of domestic industry through varying forms of protection, is a pervasive element of economic policy in today's less developed countries[1]. Further, G.K. Helleiner asserts that disillusion with export prospects, the desire for rapid growth for industrialisation and the pressure of balance of payment difficulties have pushed the strategy of import substitution to the fore in many developing countries[17].

In a comprehensive and well integrated manner the definition of import substitution could be summed up as follows: Import substitution is a means of promoting industrial development; it is domestic

production of what would otherwise have been imported; it takes place if domestic production rises faster than imports; it is one of the strategies to control import leading to self-reliance; scarcity of foreign exchange, acute paucity of non-project aid and unfavourable balance of trade result in import substitution; it is a function of development and planning; it has evolved out of foreign exchange crisis and hence it is essentially a strategy to cope with our unfavourable balance of payment; it is a hidden element in industrial development and development plans and above all it is a pervasive element of economic policy in today's less developed and developing countries.

1.2. The process of import substitution

As an economy develops, it has to be expected that local production will supplant imports to some extent. This process is likely to occur even if no governmental policies are applied to encourage it. One reason for this is that expanding population and incomes result in a larger market which enables entrepreneurs to undertake some manufacturing operations on a scale sufficiently large to be competitive with imports. Besides, as development proceeds, the labour and capital necessary to support

a variety of productive activities increase. This tends to reduce the comparative costs of production in lines, which, during an earlier stage of development, would have had difficulty in attracting either sufficient labour or capital. There tends to be a perfectly natural change in comparative advantage over time, which may even result in a country developing a thriving export trade in commodities which it may have previously imported. This shift will not necessarily constitute a move away from agricultural and other primary production. It may take the form of shifting to a different pattern of primary production, or it may involve the development of a higher volume of manufacturing activity. This is how the trend of import substitution is set in motion[19].

Subsequently, it would be noted that with the progress of industrialisation through import substitution, the import content of total supplies (imports plus local products) tends to decline, especially with respect to consumer goods. At an early stage of industrialisation, development of manufacturing industries in low income countries is bound to have an increasing demand for capital equipment and intermediate goods intended for the

new upcoming industries. With the further industrialisation, there emerge new skills and organisational abilities. At the same time, in course of time, the expanding markets give a vigorous fillip to the intermediate and capital goods producing industries. As industrialisation surges ahead drifting towards these more basic forms of production, side by side import substitution potential also goes on increasing[22].

1.3. Meaning of import substitution

It needs no overemphasis that import substitution problem has become a matter of considerable concern at the national level in view of economic factors, internal stresses and strains as also external aggression. It is a strategy of great significance to effectively, efficiently and expeditiously cope with the unfavourable balance of payments. Simultaneously, it also asserts itself to help one, stand entirely on one's own, unencumbered with the crutches of foreign aid and credits, thus being an economic issue with some emotional attachment.

As aptly observed earlier, import substitution is a "war child". In view of transport and

communication impediments in the wake of devastating wars, import let alone of essential goods but even of life saving drugs could not be had. Besides, the balance of payment crisis has been instrumental in making us resort to this device or strategy to get over the crucial problem of foreign exchange and build our own reserve of foreign exchange. Import substitution relates to:

(a) use of unutilised capacity;

(b) specific capacity creation for replacing imports;

and (c) investment requirements for achieving this end.

Some of the measures to pursue import substitution, which have been an important facet of our country's industrial policy, can be enumerated as follows:

(1) Substitution of imported raw materials, components and spare parts with indigenously manufactured materials and components of same or comparable specifications and according priority to their rapid development.

(2) Reduction in the consumption of imported

raw materials and components per unit of production.

(3) Progressive change-over of production of chemicals and chemical products from intermediates to their production from basic raw materials.

(4) Substitution of imported raw materials or components by suitable alternatives with consequential changes in the specification of the end-products.

(5) Acceleration of the phased manufacturing programmes to achieve greater indigenous content in the shortest possible time.

The results of import substitution may be evaluated in the following two categories:

(i) Reduction in the allocation of foreign exchange for industrial production showing how and to what extent the allocations of foreign exchange have been substantially reduced;

and (ii) increase in the production of essential commodities and goods without which import bill would have been correspondingly higher (taken at c.i.f. imported price)[14].

Import substitution is one of the many facets

of "Import Saving". It aims at the realisation of maximum possible degree of self-reliance by augmenting foreign exchange resources through larger exports and by utilising the available foreign exchange for ensuring the maximum rate of industrial growth. The inelasticity of exports and the growing import requirements provide the necessary imperative for import substitution which has always been a primary objective of our industrial development. Import saving pertains to:

(A) greater economy in the use of imported materials;

(B) use of designs and technology which reduces the requirement of imports;

and (C) substitution of domestic material already available for imported materials.

The preponderating significance of import substitution in conserving foreign exchange and accelerating economic development can be hardly over-emphasised in the context of galloping increase in prices in the world markets. It has become a password with every industrialist and economist these days. It does not only mean manufacture of components

exactly as per imported specifications but it also means that whenever such raw materials are not available or are difficult to get owing to precarious foreign exchange position or otherwise, substitution of various indigenous materials or easily available imported materials be adopted keeping in mind the view or use.

Import substitution is not merely an economic but a technical issue, too. There are areas where direct substitution of imported products is possible by indigenous products such as local benzene for imported benzene. In discussing import substitution one has to consider not only substitution of products now imported by alternative indigenous substitutes but in fact in most of the cases indigenous manufacture of the same items at present imported. Establishment of indigenous production will lead to saving in our import bill and hence foreign exchange.

Technological development would enable us to usher in not only facilities for augmenting our capabilities related to substitution for imported material but even appropriately absorb into our prevailing socio-economic system the already imported technology through adaptation, improvisation and

modification. It is likely that, if not timely absorbed, the importation of technology would be repeated. Thus rapid and timely absorption of imported technology would enrich indigenous technology, leading to import substitution. The rate of obsolescence of technology is exceptionally high, especially in the chemical industry. Hence time factor is of crucial importance[5]. Import substitution is a continuous economic process calling for fresh efforts and dynamic approach to self-reliance and/or self-sufficiency in the shortest possible time[13].

As we have noted above, gradually the content and meaning of import substitution in relation to changing pattern of international trade have been undergoing radical transformation. As such, the primary producing countries have been diversifying their activities to suit the prevailing conditions in the market - both domestic as well as foreign. Thus, in this context, import substitution broadly means the development by a country of domestic production of industrial goods including capital goods, raw materials, components and spare parts, industrial and technological skills, know-how, etc. which were either formerly being imported by it or which are, otherwise,

bound to be imported by it in the foreseeable future or for which there is a large domestic demand. The import substitution oriented indigenous technology has to play a vital role in the identification of items of import and produce them within the country as far as possible. The development of indigenous technology, therefore, should be accelerated to meet not merely the current needs of the industry but also for its further future requirements.

The scope of import substitution is much broader than that of all the measures for development as it means a continuous process and not mere seizing limited opportunities. Maximising the rate of growth with a given capacity to import can thus be equated, to a great extent, with the promotion of import substitution. The implications of this largely determine the developmental strategy in an import sensitive economy[23].

1.4. The value and standing of import substitution

In the light of the present oil crisis the concept and strategy of import substitution has been gaining in an over-riding significance. It is a double edged sword-like weapon or device and hence has to be very

carefully used. It would be seen that the element of import substitution has been striking deep roots in the economic systems of developed countries as well, let apart the developing, less developed, under developed or undeveloped countries. The import substitution strategy has, thus, an immense potential. It has assumed global dimensions. It is attracting urgent attention of the international agencies like the International Bank for Reconstruction and Development (IBRD), International Monetary Fund (IMF), United Nations Conference on Trade and Development (UNCTAD), United Nations Conference on Science and Technology for Development (UNCSTD), General Agreement on Trade and Tariffs (GATT) and European Economic Community (EEC).

For instance, the seven leaders from the most powerful Industrialised Nations (France, West Germany, Italy, Britain, Canada, Japan and United States) are cutting back their oil consumption. In the long run the natural sources of oil are going to deplete. Besides, oil is not everything. Other commodities are also a must to survive. It is, therefore, proper on the part of Oil Producing Exporting Countries (OPEC) (Iran, Iraq, Kuwait, etc.) to look into the proposal

for a long term fund to be set up jointly by the industrialised countries and OPEC members to compensate developing countries for imported inflation and any increase in the crude oil prices. Efforts are on at the international level like Bonn Summit to fight protectionism, strengthen the GATT and achieve durable external equilibrium[11]. This is a laudable objective in the larger interest of the community. Thus, import substitution has attained an international status and standing.

1.5. The scope and perspective

The strategy of import substitution must be implemented with all possible zeal and single-mindedness of purpose, with the decisions being made on pragmatic rather than ideological basis. It is, therefore, important to make earnest endeavours at keeping the country in a posture of optimum flexibility. It is also equally important to recognise and resist narrow, inward-looking, myopic, shortsighted policies which carry within them the seeds of subsequent inflation and balance of payment crisis. Notwithstanding the fact that superficially there is some sort of confusion in amalgmating or joining the variegated schools of thought or technology, nevertheless the studies reveal

the inner kind of unity with a rich rationale behind it which affords us a vivid picture of "Unity In Diversity".

Broadly, import substitution strategy should

(1) encourage local production of a limited number of goods without endeavouring at providing substitutes for all imports of consumer goods;

(2) promote, from the very beginning, domestic production of consumer goods, intermediate products and capital goods in which the country can realistically develop a comparative advantage;

(3) concentrate, from an early stage, on products with real export potential based on domestic resources where backward linkages can be maximised;

(4) initiate a system of moderate tariffs so arranged that the effect of rates of protection do not vary prominently between industries;

(5) lower protective barriers - protection should not discriminate against either capital, intermediate or consumer goods;

(6) establish a system of export promotion for products meeting specified conditions in order to facilitate prompt entry in international markets;

(7) make sure that the traditional export sector is not discriminated against;

(8) to determine the size and timing of the import substitution strategy on the basis of a long term industrialisation programme that related the balance of payments position to the requirements for overall economic growth[20].

1.6. The present work and its purpose

With a view to resolve the issue of economic development the path of "industrialisation with particular expansion of key and heavy industries" has been adopted by the Indian planners[3]. Inherent in such a strategy is adoption of advanced technology which is capital intensive in character. Initial development imports could be financed through increased exports, reduction in foreign exchange reserves or foreign aid and loan.

Before launching the five-year plans, India had

already attained a fair stage of agro-industrial development. She had developed consumer goods industries like textile, sugar, soap and matches. Thus, the problem of industrial development, after independence, did not begin from the initial stage. It was rather a continuation of the process that was already set in motion. Chemical industry was given its due importance in the overall planning programme[18].

The chemical industry covers a large number of heterogenous but closely interconnected group of industries. It is primarily an industry intended for manufacture of chemicals embracing a wide variety of products e.g. drugs, pharmaceuticals, paints, varnishes, agro-based chemicals such as pesticides, weedicides, fungicides, fertilisers, etc. In fact, the inputs of agriculture in terms of fertilisers and chemicals play a predominant role in accelerating the pace of agricultural development. So also the petroleum products and petro-chemicals boost up the overall efficiency augmenting communication and other infrastructural facilities. It helps creation of life saving drugs. It enhances the employment opportunities. In short, the potential for import substitution especially in chemical industry is quite

considerable indeed.

Indian experience since 1951 in economic development has demonstrated the vital role of import substitution in the planning of our economy as indicated in the first five-year plan. In this study it is proposed to analyse the trends, problems and perspective of import substitution with particular reference to chemical industry. It makes a modest endeavour at empirically verifying the impact of import substitution on the development of an industry in general and chemical industry in particular. Every care has been taken, however, to present the facts objectively and not to serve a point of view or prove case with regard to the select chemical products or chemicals analysed in this dissertation.

1.7. Constraints in the study

It has come to notice that, possibly because of the very recent thrust by the Government on the import substitution as a strategy for industrialisation in its proper perspective, there is not enough literature (mainly books) available having a direct bearing on the subject. It being a matter of topical interest, heavy reliance has been placed on the

newspaper reports, popular articles appearing therein, magazines and periodicals, focussing attention on the process of import substitution in the changing circumstances particularly in the wake of disturbing conditions in the international trade arising specially out of oil and energy crises.

The topic is almost all-embracing and all-pervasive in the sense that it touches different aspects and facets of economics, commerce, technology, science, management, research and development, politics and other allied disciplines - mostly every walk of life. However, an humble attempt has been made in the study to do proper justice to most of these aspects at the same time laying stress on the importance of import substitution proper.

The major impediments that confronted pertain to the interviews with entrepreneurs. It was found, to the utter dismay, that a peculiar sort of reluctance was evinced while discussing matters. The answers were stereotyped. This human element is the biggest ever bottleneck a researcher has to encounter!

There is lack of up-to-date data. Many times

the sequence of the data cannot be maintained because of non-availability of the data for the intervening period of the study.

1.8. Modus operandi of the study

Any study has got its own limitations and it has got to be restricted to a certain period as well as number of products. It is with this end in view the following delimitations were made to carry out the work.

1.8.1. Selection of chemicals

It would be noted that the twelve chemicals chosen belong to Agro-Food Oriented or Agro-Based Chemical Industry. The main thrust has been laid on such chemicals principally as these would go a long way in boosting up the Agro-Based Chemical Industry, agriculture obviously being the focal point in India, on which depend thousands of farmers and others, too. It is with this aim that these chemicals have been specifically selected for our study. This would certainly give a distinct picture pertaining to potentials for import substitution in this field. These chemicals could be indigenously produced, thus saving on the corresponding imports. These crucially

important chemicals have been chosen from a host of myriad chemicals, which are quite pertinent taking into account the present existing socio-economic conditions.

1.8.2. Period adopted for study

The period of study has been restricted to four years e.g. 1973-74, 1974-75, 1975-76 and 1976-77. The quaternary period ended March 1977 has been taken up, as the complete data for that period, in the Monthly Statistics of Foreign Trade of India[12] about the chemicals that have been chosen for our study, related to the India's imports and exports by commodities and countries are available, the latest issue of the publication being available for the fiscal year 1977. It, therefore, is incumbent on us to limit our exercise for that period only.

1.9. Significance of the study

We have selected this theme because we find in this research study an understanding of the problems and implications of import substitution and we can see the seeds of making the economy not only viable and feasible at the national but also as one

of the top-ranking nations in the comity of nations at the global level. In fact, it appears that the very foundation of the economy will become sound, its function very efficient and it will have a sense of direction and purpose, so that entrepreneurship and innovations which are required for standing in competition at tne international level will be safeguarded by adopting the strategies in the sphere of import substitution. The twentieth century has already witnessed outstanding scientific advances and high speed technology and explosion of knowledge in different spheres. Therefore in any economy and in particular the develcping economy, which wants to advance its interests in the minimal time, will have no other option except to incorporate and integrate its resources, innovate its activities and internationalise its standards of work. The import substitution strategy looked in this perspective will give us and come up as a very major strategy that the Indian economy should adopt in the light of the conclusions drawn on the basis of detailed and intensive studies undertaken in this work. It is a total approach. It is a macro approach. It is more than a national approach. It is a policy making

approach and will, therefore, be immensely useful to any developing economy. So lessons drawn from the strategies adopted by India will be useful to similar other countries in the world at large.

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II-CHAPTER

HISTORICAL PERSPECTIVE

II-CHAPTER

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2.1. Pre-independence period

It will be noted that during the pre-independence period, especially during the British Colonial Rule over India, the traditional primary products were exported and the same on conversion imported as final products. It was, thus, a dismal picture of economic conditions owing to political domination by alien rulers. The world trade was topsy turvy as a consequence and in the event of a series of global devastating wars and also the Great Depression of the United States of America of the 1930s. The First and Second World Wars resulted into compelling countries to be self-reliant to the extent the concerned items or products were not available[8]. The wars proved to be "a boon in disguise". The ultimate result was that not merely India got political independence but by and by economic emancipation was also set in motion. The pre-world war period of Colonial Rule gave a good ground for import substitution. The world wars sowed the seeds of import substitution in terms of self-reliance. The Swadeshi Movement culminated in actually translating into action all that is implied in import substitution.

2.1.1. Pre-world war period

On the whole the Indian economy was more or less static and stagnant. The population problem was almost non-existent. Transport and communication facilities were not up to the mark. The people had little or no demonstration effect whatsoever. Their living standard was quite low. However, before independence, India had a fairly comfortable balance of payment position[6]. Somehow or other, the needs of the economy were a few and simple and any product which was manufactured tended to substitute imports. The low propensity to consume ensued in importing goods, being economical. It is, of course, not advisable to manufacture each and every item within the country. India was entirely dependent on imports of various capital and consumer goods prior to independence e.g. from fountain pen to power generating equipment, from writing inks to wrist watches[10]. Thus the economy was standing at a low ebb. But like all other under developed countries, India was exporting huge quantities of primary products[11].

2.1.2. World war period

The I World War left its scars adversely

affecting the global economy. The war-torn overall economy was thus in shambles. It was limping back to normalcy. As if the holocaust was not enough, on its heel the II World War broke out, further radically disrupting the entire economy. Owing to these disastrous interruptions, the international trade came to a grinding halt. The transport and communication bottlenecks, the feelings of frustration, animosity, mutual recriminations, hatrade and general apathy lurched the economic activities into a static stagnant situation. In the wake of these devastating global wars all the countries all the world over were handicapped and badly hit. As such, out of over-riding economic necessity people started taking resort to self-reliance so far as their demands and requirements were concerned. In other words, they commenced earnestly exploring the possibilities of manufacturing the goods and commodities by exploiting the resources locally available rather than depending on others. The Indian entrepreneurs were trying hard to establish their own industries. It was during this period that the alkali and ancillary industries like soda ash, caustic soda, sodium bicarbonate, bleaching powder, bleach liquor, benzene hexachloride, liquid

chlorine and others were able to establish themselves formally[9].

2.1.3. The Swadeshi Movement

The British ruled over India for a considerable period. The traditional primary products, as noted earlier, were exported and on conversion finished ones were imported into India. The economic emancipation was the need of the hour. The entire economy was in the hands of the alien rulers who ruthlessly exploited it to their best advantage. It was here the seeds of economic independence were sown, the saplings steadily sprouted, duly nurtured, nursed, nourished and a strong as well as resilient team of patriots to restore not merely political independence but economic freedom emerged. The staunch and uncompromising freedom fighters commenced in the right earnest the "Swadeshi Movement" in that the foreign goods were boycotted and even bonfire was held. This emotional and sentimental spurt led to dispensing or doing away with the foreign goods and in lieu thereof the domestic substitutes got precedence. Thus, the domestic industry got a big push. Industrial environ was undergoing radical transformation. It is worthy of note that the untiring

efforts and missionary zeal of Acharya P.C. Ray gave birth to and culminated in the establishment of the chemical industry in the early present century[9]. Thus, industrialisation through import substitution got an igniting spark sentimentally as well as emotionally only to receive a pragmatic approach during the ensuing post-independence period.

2.2. Post-independence period

The path of development through "industrialisation for home market" as against export-led growth was adopted by the developing economies (in the third world including India) facing structural problems in foreign trade. Infusing the new technology in the import sector would enable economy in having the benefits of growth with differences which would have otherwise gone over to developed economies. The developing economies principally being primary producers in the prevailing international market, have had no alternatives but to control the quantum of imports, thereby helping them evolve the process of import substitution. The vulnerability or susceptibility of the economy to the vicissitudes or changes in the international market could be eschewed, albeit not in their entirety yet partially,

through import substitution[2].

When India won its freedom, it should be noted with pride and appreciation, it was almost self-sufficient and self-reliant in textiles as well as sugar but was dependent on imports for capital goods and important chemicals[9]. Thus, it is indeed a noteworthy feature that there was a great deal of potential and adequate scope for import substitution in the field of chemical industry. The rise in the industrial activity resulted in the manufacture of several new items, thus leading to the augmentation of process of import substitution. However, the process was obviously slow owing to certain uncontrollable, extraneous, exogenous factors viz. dearth of appropriate technical know-how, requisite expertise, trained personnel, sufficient and substantial raw materials, adequate enough finance, equipment and machinery, dynamic governmental and other agencies.

The pace of industrial growth and development was being accelerated with the attainment of independence. Subsequently, as a corrolary to the finalisation and implementation of the successive five-year plans the industrial development got further

impetus. A new dimension was assigned to the problem of scarce raw materials, sophisticated components and modern machinery and equipment which were urgently required to be imported for sustaining and fostering further the growth of industries. Shortage of foreign exchange was another shortcoming. During 1956-57 the balance of payment deficit was to the tune of Rs.312.3 crores[2]. This was the major stumbling block ceasing the avenues for effecting imports of scarce materials. The situation became excessively critical towards the end of the third five year plan. Earnest endeavours were warranted for adoption of certain measures whereby imports could be considerably curtailed, if not altogether eliminated. This fostered and boosted up the production of a number of items of machinery, equipment and components in the country. Imported raw materials were substituted with the indigenous ones wherever and whenever feasible and available. Intensive as well as extensive drive had been set in motion to accomplish the avowed objective of import substitution[10].

Thus, it is since independence the industrial development process in different directions and various aspects is duly harnessed, geared and steadily

sustained as well as maintained. This is immensely evident from the fact that the Government established the Sindri Fertiliser Factory, the biggest of its kind in Asia. During 1946-50 sixty companies were authorised to issue capital totalling Rs.30 crores for the production of fine and heavy chemicals inclusive of pharmaceuticals. It would thus be crystal clear from the trend observed that the chemical industry was being given its preponderating place right from beginning in the process of industrialisation through import substitution[9].

There was foreign exchange crisis between 1956-57 at the beginning of the second five year plan[4]. Since 1957-58 more reliance and thrust are laid on import substitution measures in order to have accelerated and vigorous industrial development in India and there has been substantial switch over to indigenous production. There was remarkable trend in diversification and modernisation of production. Just a bird's eye view at the evolution of import substitution through the successive plans would throw ample light on this aspect. During the first five year plan, inter alia, emphasis was laid on the indigenous production of chemical preparations, drugs and pharmaceuticals. During the

second five year plan there was marifold rise in the indigenous production of basic chemicals such as caustic soda, soda ash, sulphuric acid and also sulphides, polyethylene, industrial explosives and vat dyes. During the third five year plan output of petroleum products and fertilisers was considerably stepped up. This trend is naturally on the increase in view of proliferating and burgeoning demand all through these years.

In August 1962, the Planning Commission constituted and set up a Technical Panel on import substitution under the Chairmanship of Mr. G.L. Mehta. The setting up of the Panel was motivated with an explicit intention of making a systematic and well planned attempt at securing substitutes for imported goods through the effective and efficient use of existing capacity in the country[2]. This was the beginning made to boost up the process of import substitution.

The Chinese aggression in 1962 and the conflict with Pakistan in 1965 gave a tremendous impetus to the work on import substitution. Newer and newer lines of import substitution were explored, pursued, sustained and further fostered and evolved. As such, there

emerged the process of substitution of imported raw materials, components and spare parts with indigenously manufactured materials and components of same or similar comparable specifications and according priority for their rapid development resulting in reduction in the consumption of imported raw materials and components per unit of production, ultimately leading to augmentation of phased manufacturing programmes to achieve an enhanced indigenous content in the shortest possible period of time[7].

It is observed with gratification that there has been a gradual, slow but steady tendency on the part of our Government to usher in and foster the industrialisation process with the due accent on measures pertaining to import substitution. The backdrop against the historical evolution of import substitution as an industrialisation strategy goes a long way to enlighten us to comprehend in its proper perspective the process of its development or evolution from its nascent or embrionic stage to the present overwhelming feature and magnitude that it has now attained. There is no denying the fact that it has secured for itself a pivotal position in the international trade, besides occupying an

indispensable place in the domestic sphere of economic activities.

The international agencies of high repute like United Nations Conference for Trade and Development (UNCTAD) and General Agreement on Trade and Tariffs (GATT) are deeply engrossed in devising ways and means to accomplish the objective of industrialisation in the larger interest of the community all the world over. Determined efforts are being made at the international level to achieve durable external equilibrium[5]. Import substitution prominently figures as one of the most important strategies and urgent attention is being directed to and focussed on making the best use of this device for the overall judicious balanced economic development by way of extending protection to less developed countries and developing economies through allotment of quotas, licences, tariffs, development loans, credits, subsidy and so on wherever and whenever feasible.

The objective function of import substitution can be said to be involved in the efficient and effective allocation of resources. The investment and import substitution pattern which led to the fastest rate of growth (maximum gross domestic product)

and the greatest increase in domestic capacity (maximum investment) are actually the same or similar in its proper perspective[3]. The big boost that industrialisation got brought in its train responsibilities to see to it that the development so attained should not merely be sustained but further accelerated, for which a suitable industrial policy was required to be framed.

2.3. Industrial policy

It is interesting to note that, historically speaking, India had had many feathers to its cap and her industrial products were increasingly finding considerable markets in all the civilised countries of the world, whereas the western countries had hardly learnt to toddle in the industrial field. Her Muslins, brocade, silks, metal and ivory wares were keenly sought after from Java in the East to Jamaica in the West. India was thus on the height of its success in the international trade.

However, as we have noted in the past, the advent of British rule brought in its train conspicuous changes in both the economic and political life of the country. Though British Rule gave to some

extent a political stability to India, yet it was instrumental in ruining her industrial structure. The place of India on the industrial map of the world paled into insignificance, it being a market for the industrial produce of U.K. and Europe. Today in the words of Pandit Nehru, "A number of textile mills in Ahmedabad or Bombay or Kanpur is not industrialisation; it is merely playing with it. I do not object to textile mills; we need them; but our idea of industrialisation will be limited, cribbed, cabined and confined by thinking of these ordinary textile mills and calling it industrialisation. Industrialisation produces machines, it produces steel, it produces power. They are the base."

India's industrial policy was first announced by the Government in 1948. It contemplated a mixed economy with an overall responsibility of the Government for the planned development of industries and their regulation in national interest. State had had the right to have an industrial undertaking in the public interest but it reserved a proper sphere for private enterprise. In the light of socialistic pattern of society as the objective, another announcement was made on 30th April 1956, in that the

State could undertake any type of industrial production. However, Industries (Development and Regulation) Act, 1951, was enacted to equip the Government with the adequate powers so that the industrial policy could be successfully translated into action. Government took steps and thus encouraged indigenous industry through their stores purchase policy and necessary instructions issued to the Directorate General of Supplies and Disposals (the central purchase organisation of the Government of India), culminating in strong support to import substitution.

As for the commercial policy, it has been so formulated as to meet India's requirements and satiate her aspirations. Maintenance and developmental imports are needed to begin with. Due to constraints of foreign exchange, tight import control measures have been resorted to. These controls were initially adopted in India as a war measure under the then Defence of India Rules in May 1940, primarily with the object of conserving shipping space. Later on it was applicable to a large number of commodities. In order to extend the controls, Imports and Exports (Control) Act (1947) was enacted. Government of India issued the Imports (Control) Order, 1955. The Act is the

focal point leading to the movement of entire Import Trade Control set-up around it. No item can be imported without a valid licence or a customs clearance permit issued in accordance with the provisions of the Imports (Control) Order or Open General Licence issued by the Central Government. The objective of the import control is intended for judicious spendings of scarce foreign exchange (though as at present the foreign exchange remittances by Indians abroad have made the position somewhat comfortable) and procedures laid down with a view to have rational distribution of the available foreign exchange resources taking into account the relative importance and the requirements of different industries. Maximum use of indigenously available resources is advocated. Schemes of genuinely import saving character had special significance.

Thus all along it would be seen that the Government of India has been pursuing the policy of fostering the process of import substitution in one way or the other. This has of course been helpful in accelerating the pace of industrialisation at the same time developing the technological capabilities, creating employment opportunities and other attendant advantages thus accruing therefrom[1].

When we look at the "contemporary industrial scene", we find, in fact, that it is the industry where application of import substitution could be made. Both are inextricably interdependent. As such, it is all the more essential to delve into the aspect pertaining to contemporary industries which would go a long way to know the trend of industrial development. Therefore in the subsequent chapter an endeavour has been initiated to look at the industrial scene that would give us the idea as to how those industries have been trying to adopt the "import substitution" strategy to augment the pace of industrialisation.

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III-CHAPTER

CONTEMPORARY INDUSTRIAL SCENE

III-CHAPTER

CONTEMPORARY INDUSTRIAL SCENE

3.1. Preamble

Industrial growth and development are very much inherent in the process of "industrialisation". The industrial revolution gave a big push to industrial advancement with the invention and use of machinery and equipment devised to boost up the overall production, productivity and distribution system. The wheels of economy were thus geared and set in motion for onward growth and forward march. It would be seen that the industries were not merely emerging but briskly burgeoning with the onset of technological and innovational progress. Almost in all the industries at all places the world over near identical conditions were prevailing. In fact, no country had had self-sufficiency and more so the developing one. As such, the traditional primary producing countries were to have the import of certain capital goods and hence developmental and maintenance imports were required to be made by them[8]. The industries in general were primarily seen to be proliferating in several spheres mainly by importing these goods and services (e.g. raw materials, skill, finance, know-how and so forth) that were either not at all available or were scarce. At the same time they exported those

items which were in surfeit with them. The countries like Japan, China, Germany, Russia, America, Israel and at the present juncture the Gulf oil producing exporting countries gave due impetus on and made significant strides in the field of industrialisation. Historically speaking, concentrated attempts were made all along by all the countries to be self-reliant, so that they need not go with a begging bowl for help and assistance. Substitution effect to stand on their own reigned supreme to attain spectacular success in accelerating the pace of industrialisation.

These sustained efforts to effectively meet the indigenous pent up demands, depending upon others to the minimum extent possible, went a long way to speed up the process of industrialisation. In other words, import substitution was assigned and is being assigned consistently and persistently a key role not only to be self-reliant and self-sufficient to the maximum extent feasible to meet the local requirements but also to have the export potentials and thus extend the helping hand to the needy brethren, wherever possible. Having made a dent into the general condition of industry, it is warranted that the process of industrialisation be looked into.

3.2. Process of industrialisation

The rise of an industry could be attributed to the systematic changes in supply and demand conditions with rising incomes. The two important factors are:

(1) the overall increase in capital stock per worker;

and (2) the increase in education and skill of all kinds.

The combination of labour, capital and skills will vary from sector to sector and country to country as well as from time to time. Change in factor supplies will result in comparative advantages as per capita income rises. There may be some uniformity in patterns of growth in view of some degree of simalirities in supply and demand conditions in all countries. These may be called "universal factors" which are distinguished from variable "particular factors". The universal factors could comprise:

(a) common technological knowledge and expertise;

(b) similar human wants;

(c) access to the same market for imports and exports;

(d) the accumulation of capital as the level of income increases;

and (e) the increase in skills, broadly defined, as income increases.

Historically speaking, the advancement of a country would come about in an environment wherein trading possibilities and technology are subjected to constant change. Thus, it would be seen that the changes in trading possibilities and technology would culminate in the emergence of new industries, thereby contributing towards the overall economic development. Naturally, industrialisation would extend opportunities for more employment, full capacity utilisation and resource mobilisation. This industrialisation is, thus, inherent in a good number of changes in the economic structure. Some of them may be enumerated as below:

(i) a rise in the relative importance of manufacturing industry;

(ii) a change in the composition of industrial output;

and(iii) changes in the production techniques and sources of supply for individual commodities.

Furthermore, the causes for industrialisation could be as follows:

(A) the substitution of domestic production for imports;

(B) growth in final use of industrial products;

and (C) growth of intermediate demand stemming from (A) and (B)[1].

Thus, the process of industrialisation is set in motion. Its pace is augmented with the aid and introduction of various technologies mainly arising out of the changing needs. As we have noticed earlier, the substitution effect owing to economic necessity and other compelling conditions sparked off the rapid rise in the industrial growth and development. This resulted into the chain of activities all over the world to make the best possible use of factor endowments and other facilities to achieve not merely self-reliance but even to explore the avenues of exports. This trend of industrialisation has to be critically looked into in its proper perspective and problems that acted as a damper and came in the way of industrial development be resolved.

However, it is noted in the light of the industrialisation process, all along that mainly the import substitution was and has even now been the only handy strategy for accelerating the pace of industrialisation, keeping in view a few of the problems or implications as discussed in Chapter-V. Study of contemporary industries vis-a-vis the Indian industry, in the ensuing paras, would reveal the trend of import substitution - a versatile strategy for overall economic development.

3.3. Industrial development in India vis-a-vis a few other countries

In the forthcoming Chapter-IV adequate light has been thrown on the growth and development of Indian industry laying emphasis on chemical industry, since the main thrust in the thesis is placed on the study of this industry in particular. As such, it is pertinent only to have a cursory glance over it, rather than going through it exhaustively over again. It would be seen that the real industrial development commenced in its proper perspective and right earnest only after the Great Wars. The global condition of industry prior to world wars, was, to say the least,

primitive in so far as the technological advancements, scientific inventions are concerned, they being of the recent origin. No country could be said and afford to be, though it could be relatively, absolutely self-sufficient in view of inherent limitations that nature has brought to bear[2]. It is, therefore, only appropriate to think of industrial development after industrial revolution with the onset and vigorous application of novel innovations that accelerated the pace of industrialisation.

In this perspective and keeping in view the trend of industrial development, it would be observed that India found its place on the world map of international trade particularly after its attainment of political independence and economic emancipation from the clutches of the Colonial Rule, thereby enabling it to usher in the judiciously planned overall development. Indian industry has made significant strides with the aid of scientific and technological advancements and breakthroughs in the field[9].

As indicated by the then Industries Minister time and again in his speeches, the industrial growth rate of 8% achieved in the last year (1978) can be

maintained this year, too, despite power shortage, energy being one of the most important factors of production[4]. Although the industrial growth rate for 1978-79 has been estimated at 7.4%, yet it will not only be maintained but improved upon, said the then Industries Minister George Fernandez. He has further confidently and optimistically predicted this year as a year of more accelerated growth and employment for the Indian economy[6]. This just goes to show the generation of positive tendency and great confidence in the industrial culture to forge forth with fortitude to abundantly augment the pace of industrialisation. The Chinese War of 1962 and war with Pakistan in 1965, besides the earlier World Wars, have worked as a boon in disguise, in that India could have introspection and the loopholes and lacunae could be largely bridged to be in readiness to effectively ward off the calamities by way of adequate advancements in various industrial fields e.g. defence, chemicals, textile, jute, cement, sugar, iron and steel, engineering, shipping, electronics and others. In all these industrial spheres the headway made by India is quite significant indeed. The agro-based chemical industries have come to occupy a pioneering position. This is a laudable

feature in view of the fact that India is an agricultural oriented country. The chemicals and fertilisers as well as pesticides are instrumental in considerably enhancing the agricultural output. All these industries are growing hand in glove in a well integrated, coordinated and cohesive manner boosting up the overall economy of the country.

It is widely seen that the element of self-reliance assumes a preponderating position in the industrial development. It is proposed, to see through this aspect, to study the industrial development in other countries in the following paragraphs.

It is the universal truth that as an economy starts developing, the local production commences supplanting imports to some extent albeit no governmental policies are applied to encourage it. Expansion of population and rise in income require large markets. This attracts the entrepreneurs to engage themselves in adequately large scale manufacturing operations to be competitive with imports. Commensurate with the development, labour and capital register the necessary increase. This results in deriving comparative advantages even

reaching a stage where export can be visualised to a certain magnitude. This may involve the evolution of higher volume of manufacturing activity. In fact, Indian economy has considerably advanced and made copious progress by innovations in the production technology, application of modern management techniques and to some extent improvements in the infrastructural facilities of transport and communication, especially by way of adopting the import substitution strategy as far as practicable[3]. This is how in general the pump priming effect works on the industrialisation process. Contemporaneous industrial development in some of the countries is intended for discussion in the following.

3.3.1. Japan

It might not be out of place here to cite an instance of Japanese industry having inclination towards import substitution activities on the basis of achievement of self-reliance and also self-sufficiency to the extent feasible even in the very teeth of the colonial pressure on them restricting their independence in the international trade. There has been a dramatic change in the trade pattern of Japan in the last three decades of the 19th century. The finished goods as a proportion of total Japanese

imports fell from over 50% in the 1870s to about 30% in the closing five years of the century. During the same period imports of raw materials rose from a mere 4% of the total to nearly 27%. This dramatic transformation in the import pattern indicates that the process of import substitution can take place even in the absence of protectionist governmental policies designed to bring it about. This is particularly obvious in the case of Japan, as it had signed treaties with European countries and the United States which compelled her to pursue a policy of free trade and not impose protective tariffs or other restrictions on imports from abroad. Japan did not obtain a completely free hand in her tariff policy until 1911. By that time Japan started emerging as an important producer of manufactured goods for both the domestic as well as export markets.

It would be improper to say that Japanese Government was not concerned about the development of domestic production of manufactures, during this period. Japan was isolated from the rest of the world for 250 years having been caught up with Europe and the United States. The Government tried to encourage industrial development within the limitations imposed

by the treaty obligations. The first step initiated was direct government investment in industry and technical assistance. These modest efforts brought some fruit but obviously they were not impressive. In the 1880s the manufacturing plants which had been started by the government in the previous decades were either turned over to private ownership or closed down.

Textile industry played a vital role in Japanese industry with the aid of and support from the Japanese Government. After Japan was opened to foreign trade, the native cotton textile industry was to face stiff competition from the flood of imported cheaper and superior goods as compared to the domestic textiles. In 1870 three spinning mills were erected in Japan with a view to checking the importation of cotton yarn. By about 1881, thirteen small mills had spread in and around the country. But none of these were successful. Bad location of mills, their dependence on water power, the machines not being adapted to Japanese cotton, and inability of workers to handle properly the machines were the constraints adversely affecting the development of textile industry. The Japanese spinning industry in fact got a shot in the

arm with the establishment of the privately-run and owned Osaka Spinning Company with 15000 steam-powered spindles in 1883. Machine weaving industry was established. The government exerted its due influence and ushered in modern methods of silk reeling. Obviously, it would be easy to obtain a misleading impression of the role of the government in these developments if one were unaware of the scale of activity in the private sector.

Japan increased the percentage of manufactured and semi-manufactured goods as a proportion of total exports from 34% in 1875 to over 75% in 1900. The percentage for food and raw materials fell from 59% to 25% in the same period. These developments were accompanied by a rapid rise in and expansion of both imports as well as exports[7]. Among the important countries in the world, Japan does not make any distinction between indigenous and imported offers, naturally because of the inherent strength of its industry and its economy[5].

As at present, the Japanese industry has indeed become an ideal industry the world over. Right from the simple toy industry entertaining the children by

way of manufacturing cheaper, better, attractive fancy articles to highly sophisticated industry producing electronic and other economical, efficient, effective, precision devices, gadgets, instruments, machinery, equipment of great significance having immense utility value to the elite - top executives - and others has been the path cautiously and confidently tread by the Japanese industry, thus setting an example before the world. Their method of importing technology, its improvisation to suit the indigenously available materials going into it and thus making it adaptable to the local conditions is ingenous and worth emulating indeed. To cite an instance in this respect, their cheaper and superior radios, calculators, cameras and a host of myriad precision equipment, based on borrowed but later on improvised relevant indigenous technology, flooded the very markets of the countries that provided them the original technology. This speaks volumes about the rapid qualitative, quantitative and versatile phenomenal advancement of the Japanese industry. It becomes all the more noteworthy in view of its indomitable spirit to face with fortitude the holocaust perpetrated on it during the World Wars

(the bombing of Nagasaki has left an indelible scar on the minds of the human beings!). Their industrialisation as a matter of fact, commenced from the boot strap almost out of nothing and now they are at the pinnacle of their success - be it an electronics industry or a chemical industry. The self-reliance arising out of dispensing with, to the maximum extent possible, the importation through the novel way of improvisation of imported technology thus substituting the alien goods and services has played and has been playing a key role in their swift industrialisation process. This gist of Japanese industry, having a chequered growth and development, is of immense help to other developing countries to emulate its example to prosper and flourish. It has, doubtless, adopted the policy of effecting import substitution as a strategy towards its industrial development and it is to be seen prominently on the world map of international trade today.

3.3.2. China

China is also one of the Asian countries, like Japan, which has been experiencing the chequered growth and development of its industry. As is the universal stark reality, every country should make the

best use of its available resources (men, money, material, skill, energy and machinery) rather than depend upon others for not only its advancement but even to face a calamity that might confront it ruthlessly. It is worth recalling that when China was rocked by severe earthquake in 1976, it declined the offer of outside help and faced the situation with fortitude[12].

Over a span of 25 years from October 1, 1949, after the Chinese Revolution, China made very magnificient progress achieving a unique position on the world map. It is a noteworthy feature that together with the political reshuffles, China made significant strides in technological accomplishments. Here it should not be forgotten that, as others, China was also adversely affected by the devastating World Wars and it had also to face similar problems arising out of the holocaust inflicted on it. The economy inherited by the new regime was in shambles. Industry and commerce had almost come to a standstill in major urban centres. Inflation had ruined confidence in the money system. Chinese planning had taken entirely a new turn over every 7-8 years. In the year 1958, at the outset of the

Great Leap Forward, Mao initiated the policy of "walking on two legs". It included creation of communes and simultaneous development of small and medium sized industry with stress on the indigenous techniques. With the withdrawal of Russian technical aid in 1960, small scale industry got an impetus with thrust on decentralisation. Mao laid emphasis on self-reliance and technological independence, decentralisation as well as setting up of communes to bring a very large section of industry under local control. The technological policy promulgated by the Chinese press imparted a new meaning and content to the agro-oriented local industries and decentralisation of the industrial sector[10].

The principal industries promoted in China at local level were chemical fertiliser, cement, iron and steel, paper, engineering and energy. In early 1974 there were about 1800 fertiliser plants in China. The Chinese planners were responsible for the dismal failures as well as stupendous successes of their industry. Their achievements could be enumerated as follows: (a) building of 12000 ton hydraulic free forging press, (b) 10000 ton ship building in very short span of 40 days, (c) steel production by the

latest process, (d) manufacture of a number of precision instruments including lathes, automatic stereocamera, (e) synthesis of insulin, (f) world's first synthetic benzene plant, etc. The Chinese consumer goods like motor cycles, bicycles, etc. are being exported to its neighbouring countries.

It is seen that technology implication is not a neutral process, as it is to the West, but it has to be associated with social goals beyond temporary economic returns. The Chinese experience in industrialisation through technology adaptation throws ample light on the points given below: (1) macro-level technology would be a feasible and viable solution for decentralisation, (2) priorities should be assigned, keeping in view the economic considerations, to different industries to be set up on small scale, (3) mass mobilisation of the population play a role especially in the massive programme of rural industrialisation, (4) Chinese experience has indicated the viability of some of the small capital goods industrial units and conditions for their promotion[11].

As could be noticed, the Chinese chemical industry had made significant strides. The synthesis

of insulin and the existence of world's first synthetic benzene plant in China bear an eloquent testimony to its advancement in the sphere of chemical industry. Thus, it is quite obvious that they have laid a thrust on self-reliance and further they have made a considerable headway in this direction.

3.3.3. The Gulf Countries[13]

In the event of the recent development arising out of an oil crisis, the Gulf Countries who are the main producers of the petroleum products and crude oil have come to the forefront. It is, therefore, all the more pertinent to study the process of industrial development in those countries. This would certainly go a long way in establishing the facts as to the trend of development of industries in that part of the world. It would further throw ample light on the repercussions that arise out of international trade relations with other countries all over the world.

Bahrain

Traditionally, Bahrain's wealth has come from its pearling industry. In ancient Mesopotamia, Greece and Rome, Bahrain was renowned for its pearls, and this fame remained until at least the 19th

century. Then it began to decline. The Great Depression in the West pushed the industry into a slump from which it could not recover. Cheaper Japanese cultured pearls took the place of the natural pearls of Bahrain. However, with the discovery of oil Bahrain's economy was restored. A British prospecting company predicted in 1920s that oil in commercial quantities would be available. Crude oil was being produced. A small refinery was established. Production of 250,000 barrels a day could be made. Oil revenue is expected to reach $230 million in 1976, or 72% of Bahrain's total income. But its oil resources are expected to run out before the end of the century. So Bahrain has begun to diversify its economy to make it less dependent on oil. The experience gathered over a 30-year period from the refinery has created a small but significant pool of skilled labour. In 1971 an aluminium smelter was set up by Aluminium Bahrain Co. (Alba) in which the Bahrain Government owned 17% of the shares, the remainder being taken away by six Western companies. It was the biggest project unrelated to the oil in the Gulf.

At about the same time as Alba started

production, the Organisation of Arab Petroleum Exporting Countries (OAPEC) chose Bahrain as a site for dry dock. The refinery, the smelter and the dry dock are about all Bahrain can absorb at present in terms of large scale industrial projects. The ambitious government intends to concentrate on building up ancillary industries, developing an infrastructure to allow the island to expand as a services and banking centre and to exploit its tourist potential. Bahrain already has a small nucleus of light industries built up with government encouragement. The country's broad industrial base will also help its growth as a major commercial centre. In recent years, it has become a base for companies active in the Gulf and is even being used by some as their Middle East Headquarters.

Iran

Most of the oil-producing states in the Middle East are realising the need to broaden their economies in order to lessen their dependence on oil, and are making frantic efforts to develop other industries. In this respect, Iran is much more advanced than many of its neighbours. Industry is already making a considerable contribution to the economy. Industrial

expansion over the past few years has exceeded growth targets, and the annual rate has been about 15%. Total investment in industry and mining in 1975 was estimated to have been about IR 200,000 million ($ 2,900 million), of which about half was provided by the private sector. Export of industrial products rose by 27% in 1975.

The Iranian steel industry is receiving considerable attention in development programmes. The integrated plant at Isfahan was built with the Soviet help. As regards heavy industry, drilling equipment, pumps and other machines are produced at the Tabriz Machine-Tool Plant which was built with the aid from Czechoslovakia. With regard to car industry, Iran General Motors Co., a joint venture between General Motors of the United States and the Iran Jeep and Jeep Parts Co., has been producing 4- and 6-cylinder cars. It has been exporting commercial vehicles assembled in its plants. It also produces a wide range of other motor vehicles, including motor cycles, tractors and fork-lift trucks. There is also a growing market for traditional Iranian handicrafts. Its textile industry is also expanding fast. It also produces chemicals and pharmaceuticals. A host of myriad or innumerable major petrochemicals projects are under consideration

with most of the industrialised nations expressing interest in joint ventures in Iran. Oil refining is well established in Iran. One of the biggest projects is for the manufacture of polyethylene, plasticisers and aromatics at Abadan.

Iraq

In the present post-oil-price-increase era Iraq is spearheading with an industrialisation programme in which multi-million dollar contracts are awarded almost daily. The emphasis is laid on the exploitation of locally available raw materials with export potential, diversification away from dependence on oil and a complete revitalisation of the mostly small scale manufacturing industries which have dominated the non-oil sector in recent years. Until the huge programme of industrial expansion began to take shape in 1974-75, non-oil industry was oriented mainly towards simple consumer goods, manufacturing footwear, soap, sugar and cigarettes. Most of the heavy industrial projects now under consideration are oil based or dependent on gas. Petrochemicals have a ready market in such neighbouring countries as Jordon, Syria and Lebanon, where traditional industries can absorb synthetic fibres and dyestuffs and where

fertilisers and plastics are also in demand. The $ 1,000 million contract for the construction of a complex at Basra, the country's first petrochemical facility, was won by a West German/U.S. Joint Venture in February 1976. By-product gas from crude oil production in Southern Iraq is proposed to be used to fuel the first Basra petrochemical complex.

Iraq's construction material industry is expanding rapidly. It is likely to produce nine million tonnes of cement, of which six million will be exported. It is further increasingly exporting sulphur to India, China, Indonesia, Pakistan and scores of other Arab and African states. Besides, as the various chemical fertiliser projects get under way, they will also add to non-oil earnings.

Kuwait

Diversification of its economy away from dependence on oil and gas resources is gaining in an over-riding importance. Kuwait's main constraint on its development is lack of natural resources apart from oil and gas. Hence, it has to import all other raw materials. Further, it has a limited size of the domestic market as the population is still under one

million (1975 census), resulting in lack of man-power which has entailed Kuwait to import the bulk of its industrial work force.

The only heavy industry to emerge in Kuwait so far is in the manufacture of petroleum and hydrocarbon products which accounted for 65.5% of total industrial output in 1972. The biggest single operator in oil- and gas-related industries is Petrochemical Industries Co. (PIC) set up in 1963 to manufacture fertilisers. Output from its Liquified Petroleum Gas (LPA) plant is to act as feedstock for $ 500 million olefines complex to be set up as a joint venture with W.R. Grace of the United States. The other area having scope for major expansion is in construction and affiliated industries. Kuwait Metal Pipes is yet another company expanding its production from the present level of 43,000 tons to 70,000 tons. About 1/3 of its output is exported to Egypt.

Oman

Here again the government policy is to diversify its economic resources so as not to be over-dependent on oil, and the introduction of light industries is initiated to achieve this end.

Industries connected with agriculture and fisheries have been set up. Half the employees in the date-processing plant at Nizwa are women. There are projects for gas utilisation, for fertiliser complex and for liquefaction plant. The extensive construction programmes have expanded the building industry.

Government is looking for income-generating projects other than oil such as the exploitation of copper, asbestos, phosphates, coal, manganese and chrome. Projects pertaining to smelting and refining are under consideration which would employ about 2000 people.

Qatar

As in any of the other Gulf States, diversification efforts to reduce dependence on oil as the single source of income are under way. The first industrial project dates back to 1965 and was the Qatar National Cement Co. The first-comer to Umm Said was the Qatar Fertiliser Co. (QAFCO). Close to the QAFCO plant at Umm Said is the Qatar Flour Mills Co., a project undertaken by a group of Doha merchants in 1969 and completed in 1972. In

co-operation with France two petroleum chemical plants are being built, one at Umm Said and the other at Dunkirk. At the end of 1974 the Qatar Government formed the Qatar Gas Co. with Shell International Gas on a 70:30 basis to bring the associated gas now being flared off at Shell Qatar's three production platforms to Umm Said.

Saudi Arabia

Saudi Arabian oil industry owes its performance to the disinterested philonthropy of a wealthy American, Charles R. Crane. Crane was deeply interested in the Middle East. He arranged with the Imam to provide experts at his own expense to help in the search for water and minerals. In recent years, the structure of the industry is undergoing a basic change. Saudi Arabia's position as a world oil power is prominent. It owns nearly 1/5 of the world's oil and has greater reserves than the U.S. and the Soviet Union combined. Twenty-four oil fields have been discovered, of which fourteen are on-shore, eight off-shore and two straddle land and sea.

United Arab Emirates (UAE)

Diversification of the industrial base using,

as far as possible, the available raw materials in the country is the principal objective of the government. Joint ventures are encouraged. For instance, an agreement between the Government of India and the UAE was reached in 1975 for a fertiliser plant in the UAE. Feasibility studies undertaken by an Indian consultancy firm proposed a large steel complex at Jebel Ali near Dubai. The sponged iron is to be imported from India for processing and the plant will have an annual capacity of 300,000 tons of mild steel billets.

In Abu Dhabi a huge oil gas-based industrial centre is planned at Jebel Dhana in conjunction with a new $ 12,000 million gas liquefaction plant. Abu Dhabi is also planning to extract the unwanted sulphur from its crude oil and turn it into sulphuric acid.

Tourism is yet another industry in which the government has evinced keen interest. The most ambitious project under construction is the Dubai Dry Dock. Foreign investment in all industrial developments is actively encouraged by the UAE Government as well as by the individual emirates and special consideration as well as incentives are given to the foreign investors.

A study of the Gulf Countries with reference to their industrial growth and development throws light on their pioneering position pertaining to crude oil and petroleum products. The only lacuna that exists is in regard to the technological competence. They have been frantically trying to overcome these impediments relying on the overseas technological assistance through entering into the foreign collaborations. Every care is being taken to see that the helping crutches do not become sine qua non of their life. In the course of time, they are developing indigenous capabilities dispensing with the foreign assistance as much as possible in as many ways as feasible.

The sum and substance of the study on "contemporary industrial scene" draws our attention to the fact that in all the countries world over, right from the beginning, the thrust was laid on the utilisation of the domestic resources. As far as possible, the efforts were made to avoid importation unless otherwise found indispensable. This trend was primarily seen among all the countries on which a study has been attempted. For instance, Japan was and has even now been striving hard to be not merely

independent economically but surging ahead in the international market. It is, though tiny, on the forefront quite strong to stand in competition with the big power like America. A regards China, it has been overcoming its problem pertaining to population explosion. In fact, they have converted this constraint into an opportunity and their development programmes are labour intensive. With regard to the Gulf countries, their position is unique indeed. They have an oil bonanza. As has been seen, they have been making sustained endeavours to plan their economy in such a way that the depleting natural oil resources alone are not relied on. Their main aim has been to diversify their economy and have established non-oil industries. This would help them conserve their oil resources which are running out with an overwhelming speed.

In other words, import substitution, in one form or other, has been playing a leading key role in the global economy. This conclusion can be very well said to be a ubiquitous one. In the light of this general condition prevalent now, it would be worth undertaking an appraisal of "chemical industry and import substitution" which has been attempted in the ensuing chapter.

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IV-CHAPTER

CHEMICAL INDUSTRY AND IMPORT SUBSTITUTION

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4.1. Preamble

The late Acharya P.C. Ray and others put in patriotic and pioneering efforts with missionary untiring zeal early in the present century to establish chemical industry. During 1901, a heralding year for the indigenous chemical industry, he, the great savant, set up the unit of Bengal Chemical and Pharmaceutical Works Ltd. in the outskirts of Calcutta and obviously the event shines across the annals of chemical industry in India as a landmark. It was followed by a similar unit at Baroda set up by the late Rajmitra B.D. Amin. Up to the I World War the development was rather slow but after 1919 the industry made spectacular strides. It might be added here that the industry was granted protection in 1931 which gave a vigorous fillip to its expansion. The frustrating constraints such as transport bottlenecks and balance of payment crisis arising out of II World War challanged the Indian entrepreneurs who made ceaseless efforts to convert the difficulties into opportunities, thus rendering themselves capable of developing the industry to meet the domestic demand. As a sequel, alkali and

ancillary industries like soda ash, caustic soda and benzene hexachloride got a firm footing and foundation. And after the War, particularly since independence, progress has been steadily sustained. Government established the Sindhri Fertiliser Factory, the biggest of its kind in Asia. The private enterprise too contributed its mite effectively, entering into the sphere of production of fine and heavy chemicals including pharmaceuticals - sixty companies were authorised to issue capital totalling Rs.30 crores during 1946-54[4].

In its modern form, the chemical industry, in fact, began in a number of countries in 1914. For quite a number of years the USA ranked first in the production of chemicals followed by Germany, UK, France, Italy, Russia and Japan. The industry considerably expanded in several countries since the outbreak of World War in 1939. The expansion of the chemical industry was noteworthy in the case of Canada. In its release in May 1944 the Dominion Bureau of Statistics placed the value of chemicals and allied products made in 1943 at 653,462,000 (Canadian Dollars) which was more than four times the pre-war value of production[1].

Chemical industry embraces a wide range and variety of industries from the giant petrochemical and fertiliser complexes to the smaller and light industries as the paints and varnishes and is closely linked with other industries in the broad industrial spectrum of the nation. It covers an overwhelmingly large number of chemical products and by-products. This is quite obvious from the definition of "chemical industry" as propounded by the Chemical Industries Committee of the International Labour Office (April 1950). Thus, the Committee defines "chemical industries" a "industries entirely or mainly devoted to the manufacture of chemical products" and "all branches of industry to the extent that they are entirely or mainly devoted to the manufacture of chemical products even in cases where the industries of which they are branches are not themselves entirely or mainly devoted to the manufacture of such products". Dividing chemicals into "heavy" and "fine" is rather difficult since the line of demarcation is quite nebulous, indistinct and tenuous. Generally speaking, the known chemicals which serve as basic material for the production of other substances are "heavy" and those which are consumed directly are "fine".

The chemical industry ranks fourth (after iron and steel, engineering and textiles) amongst the top indigenous industries of India, albeit it made a delayed start. It has made substantial strides in recent years and has come to occupy the tenth place in the world[6]. It is highly capital intensive and has a high rate of technological obsolescence. It is knowledge oriented. There has been a sharp increase in the rate of growth due to the stimulation provided under the national plans[15]. Thus, this industry holds a pre-eminent key position in the economy of every country and the products of the industry find extensive use in day-to-day life as, for instance, in the form of household utilities, food, medicine, apparel and other furnishings. Practically, the entire industrial, economic and social life of the world is, thus, consuming chemicals in one form or the other. The industry materially contributes to the national attempts towards planned development and plays a vital role in the nation's defensive as well as offensive capabilities. Sulphuric and nitric acids form the bases of modern explosives which are of supreme importance in times of war. Chemical products are substituting several materials in other sectors of the

economy and are servicing almost every industry. Thus, its products are used in large quantities in a number of other industries like textiles, papers, glass, tanning, paints and pigments, soap and glycerine, matches, minerals and vegetable oils which are usually grouped under chemical process industries[1].

The development of chemical manufacture is inherent in its chequered growth and development, as could be seen in the following.

4.2. Development of chemical manufacture

The origin of chemical manufacture in India can be traced back to ancient times when, though operations were conducted on a very small scale, many chemicals like alum nitre and salt-petre were manufactured. Messrs. D. Waldie and Co. Ltd. was established towards the middle of the 19th century - the oldest Indian factory. However, it did not make any significant strides. In fact, it was only during the last Great War that real development took place in India. Because of the war the foreign suppliers were cut off. This acted as a stimulant to the manufacture of a number of chemicals. In 1921, only fourteen large chemical works were there in India

employing 2392 workers. By 1931 the number of large establishments soared to as high as 38 and the number of workers rose to 7968. The development of the chemical industry since the last war can be divided into three periods.

The first one relates to the period prior to the enactment of the heavy chemical industry (protection) act in October 1931. Only sulphuric acid and chemicals derived from it were manufactured in India at the time of the Tariff Board Enquiry. Chemical of the alkali group was not manufactured. Natural protection from foreign competition was accorded to the manufacture of sulphuric acid and other acids like hydrochloric and nitric acid derived from it. The prices of the imported acids were always more than those of the indigenous manufacture, since owing to their corrosive quality and high packing expenses the ocean freights were high. Besides, the indigenous producers could derive profit despite manufacturing these acids on a comparatively small scale.

The second one pertains to the period between 1931 and the outbreak of the World War. On the expiry of the Act on 31st March 1933, the protective duties stood revoked, and no extension to the period

of protection was granted by the government. Baroda and Mysore States had flourishing chemical industry. However, in 1935 the location of industry was mainly found to be in Bengal, Bombay having the second order of priority. Bengal occupied the first place in 1939, too, second one having been given to Baroda.

The third one concerns with the World War. Five and a half years imparted great impetus to the development of chemical manufacture in India. New industries came into vogue and the old ones were rehabilitated, expanded as well as diversified and modernised resulting in huge production of scores of chemicals[1].

In sum, the I World War goaded the Indian chemical industry. Acid factories were first to be set up in view of the difficulty in importing hazardous chemicals. The II World War further boosted up the chemical industry and shortly after the devastating war, especially following Indian Independence (in 1947), the industry commenced making fast headway on its own.

Development during the last about thirty years has been quite significant bringing the industry to

the forefront among the Indian industry in augmenting the productivity and production to a considerable degree. India has been brought in line with economically advanced countries by dint of opening up of new branches of the industry developed with a high level of technical perfection and competence. As we have noted earlier, being chemical industry what it is, it embraces an umpteen number of synthetic products - drugs, plastics, pesticides, pharmaceuticals, synthetic fibres, rubbers, soaps, detergents, dyestuffs and intermediates, thus expanding its scope and content to a very great extent[7].

As a developing country, India established the chemical industry with foreign know-how and imported plants and equipment. However, the scene underwent a considerable amount of change after independence when she was in a position to control her own economic development with sustained endeavours at self-reliance and there has been a regular scale down of her dependence on foreign countries. Thus, the manufacture of chemicals on the basis of indigenous technology and resources assumed a great significance and the trend of the development of chemical industry has given a shot in the arm of the overall economic

development of the country. It is in the light of this trend that it becomes all the more desirable to see the characteristics of the chemical industry.

4.3. Characteristics of chemical industry

The chemical industry in India has grown up largely in a haphazard manner, as quite a few others. There was no plan behind it, as obviously planning is a recent phenomenon. Had the locations been chosen for producing units taking into account the availability of raw materials, labour, fuel and electric energy, access to transport and proximity to markets, these units would have made copious progress and the picture would have been quite different. It is indeed not possible to have such an ideal place to reap all the attendant advantages. It seems that there are only about twenty places in the world ideally suited for a chemical industry and not one of them is in India. Best out of them available should have been selected. Wherever suitable units are found, they are at best happy accidents. One cannot help recalling, in this context, Tughlaq's historic endeavour at shifting the capital from Delhi to Daulatabad, if relocation of the units were to be thought of and effected[5].

It is interesting to note that chemical industry is heterogenous in structure representing at one end chemicals produced in large tonnage of low value per unit and at the other end specialities in a few tonnes or kgs of large value per unit of production, unlike the other basic industries, such as iron and steel, cement, sugar, coal and paper that are necessarily homogenous in structure[15].

It can be said that there can be no limit to the development of chemical industry. As industrialisation progresses, consumption of chemicals also shoots up. Research is finding new uses for a number of chemicals. Chemical industrialisation creates demands for larger amounts of chemicals in turn. It is the characteristic feature of the chemical industry that it is its own best customer.

Another characteristic feature of the chemical industry is that it has great economic flexibility. A good number of raw materials are available for the same product. As such, the peculiar economic conditions prevailing in various countries change the yields of the major products and determine the number and character of the by-products.

The present age should, in fact, be called the "chemical age". Almost every aspect of our daily life is closely connected with the chemical industry. Artificial silk, wool and fibers are assuming preponderating significance day by day. Further, artificial leather and artificial building materials have commenced ousting the natural materials. Plastic products like bakelite have not merely made it possible for electrical industries to develop into proportion but also made inroads in the fields like glass panes, tableware and numerous fancy articles, which were formerly made only out of porcelain or glass. Chemical fertilisers and drugs have become necessary for existence. Chemical foodstuffs like fats are no longer items of curiosity in countries like Germany where natural fats are not adequately available. As a matter of fact, but for the marvellous developments in synthetic liquid fuels, Germany would not have been in a position to survive the first few months of the War. It would be interesting, enlightening and informative to look to the near future for far-reaching developments modifying our entire outlook in life as a result of advancement in chemical industry, touching almost every aspect of our life, obviously to a much larger extent than the

development of the steam engine or electricity have done in earlier times[1].

The chemical industry is technology and knowledge-oriented. Hence it needs to be developed initially through investment from abroad in order obviously to reap the advantages of quick dissemination of advanced technology, also bringing in its train considerable capital inflow. Multinational corporations have been instrumental in enlarging the horizon of the chemical industry, their subsidiaries having ready and direct access to the results of research and development conducted abroad. Rapid expansion of the industry went hand in glove with the fast indigenisation leading to the prosperity and stability, to that extent, for state-owned undertakings and Indian enterprises. This ensued in (a) high growth rates, (b) fast changing technologies, (c) creation of longer and longer plants and (d) diminishing cost of production.

Local engineering and consultancy firms are sprouting forth in the wake of growth and expansion of the chemical industry evolving high technical competence and furnishing a comprehensive range of

technical and scientific equipment. There is, of late, great emphasis laid by national laboratories on applied work leading to development of indigenous know-how for industrial processes. Indian plant fabricators have been making confident ventures in the field of exports. All these efforts, put together, have generated a moving force behind the chemical industry.

Western, eastern and southern regions in India are earmarked as key points for chemical investment. Local materials are made use of by a majority of these units adding value to the Indian resources. To cite some examples, they may be, alkalies from salt obtained from sea water, petrochemicals and bulk organic chemicals from alcohol obtained from fermentation, sulphuric acid from smelter gas, glycerine from spent lye and titanium dioxide from ilmenite obtained from beach sands[7].

The rate of obsolescence of know-how in the chemical industry is extremely overwhelming and as such updating the processes is of utmost significance. This phenomenal feature needs to be taken care of to bring not merely the industry on even keel but to

expand and diversify as well as modernise it in the very teeth of stiff competition all over the world.

The research and development efforts in the field of chemical industry with a view to attaining self-reliance and to some extent self-sufficiency (ability to continue growth with no additional foreign aid) lead to import substitution. In the following section this aspect has been dealt with in order to assess the impact of import substitution on the development of chemical industry.

4.4. Modus operandi and impact of import substitution on the chemical industry

The very words "import substitution" project the image of something which has been imported hereto and now manufactured for the first time in our country. The significance of import substitution in conserving foreign exchange and accelerating economic development can be hardly over-emphasised, especially in the context of galloping increase in prices in the world markets.

India was a colony ruled by foreigners for centuries. Then came a change. She wanted to be free

in every respect - politically, economically and industrially. Political freedom came on August 15, 1947. Economic and industrial freedom does not come with the flick of a switch. It is a gradual, carefully planned process which can be painful and disappointing leading to misery and disaster if misfired due to bad planning. Economic freedom, therefore, is inherent in import substitution through self-reliance. It should be appreciated that the policy of import substitution is as imperative as it is long overdue for developing countries like India. For one, the outgo of foreign exchange is becoming increasingly unbearable for these countries and unless their governments decide judiciously which imports are to be allowed liberally and which are not, these countries are liable to be perpetually tied to the apron strings of the advanced countries. As such, import substitution has been a major method of promoting industrialisation in a number of developing countries. It works as a hedge against foreign exchange uncertainties and as a potential source of domestic economic growth. It is thus one of the growth strategies of the developing countries. It, coupled with export expansion, yields considerable

gains for industrialisation of developing economies[16].

The policy of import substitution is one of the major strategies in the advancement of economy which is in the developing stage in India. Afar as practicable, the process of import substitution is the resultant effect of many national policy instruments aimed at achieving self-reliance as well as favourable balance of payment position. It implies substituting what is imported by indigenous items as far as feasible. The detailed policies and programmes of various government departments like Planning Commission, Department of Science and Technology, Directorate General of Technical Development (DGTD), Chief Controller of Imports and Exports (CCIE), Metals and Minerals Trading Corporation (MMTC) and State Trading Corporation (STC) should be coordinated to achieve this laudable objective. The various policy instruments, enacted by parliament, such as Industrial Policy Resolution, the Industry's Development and Regulations Act, Foreign Exchange Regulation Act, Monopoly Restrictive Trade Practice Act, the Five-Year Plans, guidelines for industries and annual import trade control policy are supposed to be focussed towards the afore-mentioned national

objective of self-reliance[11].

The role of research and development in import substitution culminating in rapid industrialisation needs no overemphasis. Import substitution is not only an economic but a technical issue, too. In other words, it is closely linked with technological innovations. These technological innovations are essential to the birth and growth of industrial enterprise and the economic, social and political health of the nation. The stock of technology on which innovation depends can be increased by research and development. It is neither necessary nor practical to rely entirely on one's own research and development. Every country would be required to buy technology from abroad at some stage or other. To make the best use of the imported technology internal research and development efforts are a "must" to adapt and absorb it. As such, the strategy for attaining technological self-reliance should incorporate: (1) selective buying of technology; (2) import substitution; (3) development of threshold technology and (4) development of essentially indigenous technology.

The agency like Council of Scientific and Industrial Research (CSIR) has been playing a vitally significant role in the development of indigenous or appropriate technology. It is also trying its best to keep pace with the technical developments in advanced countries. The technologies developed at these institutes (CSIR has a chain of forty research laboratories/institutes covering almost all the fields of technology) are transferred to the industry for commercial utilisation. Poly-technology clinics, which are being promoted by CSIR, will help accelerating the pace of efficient and effective transfer of technology to industry.

Having amassed imported technology over the past over two decades, the quickest pay-back to our economy is from adaptive technology or import substitution. Development of essential indigenous and threshold technology, should be our main thrust on the endeavour not merely to achieve self-reliance but also to build export potential. However, for better assimilation of imported technology, it should be purchased outright or a dynamic research institution should be associated with every import of know-how. "Technology transfer"

should be effected through the "technology transfer centres" to be set up by the government. Techno-economic survey should be conducted and review of the old and new patents filed in India carried out. Promising innovations picked up by these centres could be put to use after input of research and development effort. Lapsed patent could be utilised freely. For current patents procision of compulsory licensing under the patents law should be availed of in order to break the foreign monopoly hold on the existing know-how. This centre could also conduct techno-economic review of foreign patents and allied publications of industrially advanced countries, classify the promising ideas industry-wise and feed the same to the appropriate research and development institutions and industries. This will provide them the necessary starting point for marginal research and development work required for import substitution effort, development of threshold technology, improvements in production methods as well as diversification of production to stimulate growth of new industries. The facilities and expertise already established in the country should be utilised to full advantage in fuller utilisation of capacities, materials conservation and import substitution coupled

with curtailment of, though not eradication, non-essential imports catering particularly for elite consumption[12].

It is seen from the above discussion that import substitution quickens the pace of industrialisation. But the process of import substitution itself depends on the extent to which the process of research and development is expedited. Thus, it is the combination and well integrated co-ordination of import substitution and research and development efforts that would be conducive for and instrumental in accelerating the pace of industrialisation. The chemical industry being highly susceptible and vulnerable to technological obsolescence, the above aspects play a prominent role in the development of this industry in particular.

Having gone through the above process of import substitution and research and development, it is all the more necessary to evaluate the impact of import substitution on the development of chemical industry. We have, in the beginning of this chapter, exhaustively dealt with the mode of chemical industry. During our discussion it has been observed

that it is mainly a technology and knowledge oriented industry. It is thus inextricably intertwined with the development of technology and research and development. The chemical technology is highly obsolescent, as we know. As such, the efforts involved in the development of technology and technical know-how in the chemical industry assume menacing proportions of a gigiantic task. It becomes particularly difficult in the wake of achieving self-reliance with the scarce raw materials, lack of skilled man-power, inadequate finance, dearth of sophisticated modern equipment and machinery, insufficient adaptable technical know-how and expertise, simultaneously keeping pace with and abreast of foreign market in the international trade posing stiff competition. In the above paragraphs we have noted the implications of import substitution from the technical angle and its application to the industry as a whole. Thus, its impact on the chemical industry assumes an over-riding significance. The proper application of import-substitution strategy and utilisation of import-substituting indigenous technology have indeed been of vital importance for the growth and development of chemical industry.

In the early stage of development, the Indian chemical industry largely depended upon foreign collaboration. The sustained steps are now being taken by industry and the government to actively involve the research and development laboratories in the country both in the public and private sectors with regard to assimilation of the imported technology resulting in considerable reduction in the lacunae in the industrial research and development efforts of the country. Importation of technology in the strategic sectors cannot be ruled out altogether, but it should be quite selective. Considerable progress has been made as far as possible to do away with the (1) dependence on know-how; (2) dependence on raw materials; (3) dependence on technical consultancy services and (4) dependence on plant and equipment. As a result of the all-out attempts to resort to import substitution by way of being independent, to the extent feasible and advisable, on the above points, there is a significant and sustained trend to develop indigenous capability in the field of chemical industry. For instance, domestic capability for developing know-how for the petrochemicals, which were earlier being run with the help of foreign collaboration, is being gradually

organised. Likewise design and fabrication capability for plants, equipment and control instruments are being developed. Concerted efforts are being made to develop indigenous know-how and engineering designs for the utilisation of down-stream products. As far as possible, foreign collaboration is being dispensed with, with the establishment of, for example, a number of fertiliser complexes in the country. In view of the establishment, therefore, of the additional capacity for production with respect to caustic soda, soda ash and a few other bulk chemicals, it should be expected that imports of such chemicals can be entirely eliminated. Thus, in the heavy inorganic chemical sector, the country is nearly self-sufficient as regards know-how. As for other segments of Indian chemical industry relating to oils and fats, paints and varnishes, dyes, drugs and pharmaceuticals, they have reached a near self-sufficiency in regard to know-how and plant and equipment. Dyestuff industry is also increasingly becoming more or less self-reliant with the establishment of certain concerns like Hindustan Organic Chemicals Ltd. in Maharashtra (a public sector undertaking) and other private enterprises manufacturing a wide range and variety of intermediates for dyes, drugs and

pharmaceuticals[14].

The above are merely illustrative and not exhaustive details elucidating the impact of import substitution on the chemical industry, citing only a few of the examples of the chemicals in which self-reliance has been and is being accomplished. After the achievement of self-sufficiency, after a certain period of time, as is well known, there arises surplus. It is interesting to observe that the investment in chemical industry has now reached a figure of more than Rs.2500 crores (as in 1977) as compared to Rs.304 crores in 1961 and Rs.877 crores in 1966. The growth rate of the industry, as elsewhere in the world, has been one of the highest, in recent years, the overall growth rate being of the order of 17 to 18% per annum. An indication that the industry has attained a certain amount of maturity is the increasing exports of both basic chemicals and chemical-based products. From about Rs.10 crores in 1963-64, export of basic chemicals, pharmaceuticals and cosmetics has shot up to Rs.159 crores in 1976-77. The export of allied products has registered a rise from a mere Rs.8 crores in 1958-59 to Rs.134 crores in 1976-77. The

export of chemical-based products has been steadily increasing from 1972-73 at an average annual growth rate of 45%. Recent additions to the exports include detonators and safety fuses, calcined alumina, upgraded ilmenite ore and opthalmic lenses[13].

Amongst the major industries of India, the chemical industry, recorded the highest growth rates during the 1960s in gross block (440%), total assets (384%) and sales (356%) and it contributed nearly 7.2% of the national industrial capital and 7.4% in gross industrial output and nearly 8% of the net output (however, viewed in the context of the low base of 1950)[8,9]. The total investment in the Indian chemical industry has increased from Rs.304 crores in 1961 to Rs.877 crores in 1966, to Rs.1600 crores in 1970 and to over Rs.2,000 crores in 1971 which amounts to more than a third of the total investment of Rs.5,300 crores made in all the industries in the organised sector[10]. The turnover of the chemical industry has risen from Rs.120 crores in 1966 to Rs.435 crores in 1961[2] and to over Rs.2,200 crores (gross) in 1970-71[3].

The significant strides made by the chemical industry in the light of the figures in terms of

investment, turnover, growth rate are so very significant and conspicuous. The import content is being reduced to the minimum with the introduction and successful exploitation of the indigenous technology, skill and other resources. Thus, it is amply evident that the industry has certainly reached an enviable stage where the contribution of import substitution for its growth and development is not insignificant. The very fact that Government of India has been judiciously following the path of industrialisation through the attainment of self-reliance goes a long way to indicate the trend and impact of import substitution on the sufficiently substantial development of chemical industry in recent years. The picture of chemical industry is, thus, quite promising and rosy mainly in view of the fact that the import substitution strategy has been quite instrumental and conducive in bringing it to the forefront with the least possible dependence on the foreign know-how and other attendant requirements. It is worth noting that the industry has made a significant headway, thereby not merely meeting the domestic requirements indigenously but even gone a long way in making all-out attempts at exporting them, wherever feasible, as could be seen from the

figures referred to above. Happily, import substitution has left an indelible imprint on the industrialisation as a whole in general and that of chemical industry in particular.

The path of success is always fraught with scores of problems. Import substitution process, not being an exception, is confronted with an umpteen number of roadblocks and impediments. Thus, the implications involved in effective translation of import substitution in action are varied and many. International trade being what it is, comprising variegated grotesque (political, economic, social, technological, psychological) factors hindering its smooth performance, the uphill task of effective and efficient import substitution becomes all the more difficult. As such, a modest attempt has been made in the ensuing chapter to deal with some of the problems that face import substitution and certain norms have been arrived at to smoothen the process of import substitution.

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V-CHAPTER

PROBLEMS OR IMPLICATIONS OF IMPORT SUBSTITUTION

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PROBLEMS OR IMPLICATIONS OF IMPORT SUBSTITUTION

5.1. Preamble

Import substitution is a strategy intended for accelerating the pace of industrialisation having its own reward. Broadly, it is producing what used to be imported from abroad. However, generally none of the strategies is entirely fool-proof. And import substitution is not an exception therefor. As such, to adopt and implement the process of import substitution as a strategy for industrial development is normally fraught with certain limitations. Some of the pitfalls are discussed below so as to enable us to avoid them to some if not the fullest extent, and to adequately augment, both qualitatively and quantitatively, the speed of industrialisation process.

5.2. Limitations

Briefly, the problems confronting import substitution relate to: (a) inadequate foreign exchange, (b) unfavourable balance of payment, (c) political instability, (d) lack of self-confidence among the entrepreneurs about the indigenously produced goods regarding: (i) quality, (ii) sufficient

quantity to effectively meet the demand, (iii) adequate market potential, and (iv) dearth of optimum government support.

Import substitution fails to free the economy from dependence on the world economy. The multinational corporations in developing economies are bent upon defending their export markets against domestic or other alien competition. Their interest, profits, royalties and management fees constitute the relatively fixed claims upon the balance of payment, which, together with imported intermediate inputs, must be against the gross value of import substitution.

Hirschman (1968) has indicated the tendency of import substitution process that would "get stuck" without generating any linkage effects. The increased costs of inputs to potentially forward linked industries due to inefficient import substitution instead of generating further industrialisation may, as a matter of fact, hinder the development process. Besides, those who are first into the industrial sector may severely oppose the development of backward-linked industrial suppliers, as they are afraid that they will not be as much efficient and reliable as the existing world

market sources. As a consequence, there emerge market and political hurdles hindering further development of manufacturing industry after the easy first stage of import substitution has been finalised and completed.

Initially, trade barriers were in the normal course imposed upon luxury goods, so that scarce foreign exchange could be diverted for other higher priority uses, but actually resulting in inadvertent outcome of growth of domestic luxury goods industries[6].

It would be an improper assumption that as an economy moves into sustained industrialisation, it should be able to dispense with all the imports and be self-sufficient in every respect. In other words, import substitution cannot be effected ad infinitum. There is a limit to which one can pursue a policy of import substitution. It would be axiomatic to say that any country can attain the pioneering and blissful position of being self-sufficient in all material resources. International trade is a pre-condition of progress and self-sustaining growth and it implies exports and imports to and fro, unless it be that one of the participants is as yet at the pre-industrial society level[8].

Import substitution sometimes imposes rigidities. The net benefits of this policy, therefore, are difficult to evaluate. Domestic production of those goods which were earlier imported does not always reduce dependence on imports as raw materials and components, machinery and other capital goods would be required to be imported for the new production. In some of the cases the economy is bound even more than the import of finished goods.

The inflexibility would further necessitate the need of extending protection for the new industry. Permanent protection would be necessary if the new industry is "inefficient" from the viewpoint of international comparative advantages. Its productivity levels would not be up to the mark and its prices would be higher.

The rigidity introduced by the import substitution would end in the creation of monopoly structure since the plants, equipment and machinery for quite a few sophisticated items thus far imported would be essentially large relative to the domestic market.

Import substitution entails changes in the

composition pattern of the economy. It needs a flexible response from the productive sectors, achievement of which is rather difficult in an economy having imperfect markets for labour and capital. There would be price hike in the absence of the requisite spurt in output. The pressure of demand for imports cannot be lessened if the transformation in the economy is inadequate[9].

While import substitution is a "must" it would be difficult to justify it unless the cost factor is favourable. Adam Smith said, "Excellent wine could be produced in Scotland if the costs were of no consequence". Even based on doctrine of comparative advantage, import substitution can lead to the raising of costs in a developing country where the optimum level of production and efficiency has not yet been attained as compared to a developed nation. Thus, import substitution, carried without due regard to our potential competitiveness, is bound to result in high costs. This is the situation which India has been facing over the years. Not every product can be produced equally cheaply everywhere and no country in the world can be self-sufficient in every product[11].

There is a strong retaliatory measure resorted to by the importing countries by way of banning the goods of exporting countries through adoption of the protectionist policies. For instance, the Indian cotton industry is finding it increasingly difficult to push up its exports in view of the protectionist policies pursued by the developed countries. As such, the performance of the handloom sector on the export front is not reassuring. Export statistics released by the Handloom Export Promotion Council indicate that exports of cotton handloom goods at Rs.221.37 crores recorded a fall of Rs.4.19 crores in 1978-79. On the face of it, the decline seems to be marginal. But the item-wise figures show that the fall was there in spite of the fact that there was a handsome rise of about Rs.31 crores in exports of cotton handloom readymade garments. In other words, the gain in garments was more than offset by the decrease of Rs.27 crores in exports of cotton handloom fabrics and of Rs.8 crores in those of cotton handloom made-ups[2].

Import substitution has generally led to the:

(1) high import components resulting in high prices of industrial goods and normally rendering

incompetent in international markets;

(2) distortion of the pattern of resources allocation with the high rates of protection;

(3) excessive horizontal diversification at the plant and industry level;

(4) lack of adequate development of domestic raw materials for further processing and export;

and (5) discrimination against labour-intensive industries and the traditional export sectors[7].

Notwithstanding the fact that there apparently appear to be so many drawbacks in the import substitution strategy, yet there are as many inherent corresponding plus points that go a long way in justifying the strategy for accelerating the pace of industrialisation.

5.3. Justification

It is argued that import substituting industrialisation process "get-stuck" on the threshold of development of intermediate and capital goods industries. However, in these circumstances there is no hope for developing manufactured exports.

The usually observed sequence of consumer goods to capital goods production reflects governmental policies and perceptions as much as the necessary economics of manufacturing production. There have emerged efficient capital goods industries in many countries without any protection or incentives whatsoever. Increasing attention needs necessarily to be devoted to these cases.

It is sometimes justified in stressing capital goods import substitution at the expense of other types. In a closed economy without the opportunity for international trade, capital goods must be produced if the savings of an economy are to be translated into investment. Capital goods production in this case determined the level of investment. A model based on either autarchic objectives or stagnant demand for the export products which it could produce with its relatively rigid production structure, lay behind. Second Indian Five-Year Plan laid heavy emphasis upon capital goods production. A more sophisticated rationale for emphasising capital goods import substitution is that only the development of indigenous capital goods production can halt the continuing practice of importing

inappropriate technologies into the developing countries. Increasing wage rates in the industrial countries guarantee that equipment and machinery would become capital intensive. The innovations that are ushered in are likely to be labour saving rather than capital saving. Thus the generation of local capital goods industries are likely to enhance the poor country's magnitude of control over the direction and spread of technical transformation or viscitudes. A wider conception of capital goods would incorporate educational as well as research facilities and personnel, in which the need for appropriate local oriented change in teehnology is at least as great as in manufacturing industry[6].

It is quite likely that the objectives of more employment and faster rate of development are not compatible. This conflict in socio-economic objectives should be resolved. The industrialisation policy through import substitution must be balanced with a policy of gradually inducing industrialisation through agricultural improvement or promoting industries through the production of manufactured exports. It is generally believed that there is immense possibility for provision of employment through

substitution of imports for home manufacture.

In fact, it should be noted that every developmental endeavour involves cost. It is more so in respect of import substitution. Technical know-how for the manufacture of any good or product required could be produced indigenously. In case this policy is executed irrationally and indiscriminately, ignoring the costs involved, it would lead to enlarging the distortions in the economy. There would be uneconomical utilisation of indigenous resources if everything imported is substituted. This tendency should be discouraged. The implications of import substitution are indeed far-reaching on the economy and hence the programme for import substitution should be very carefully thought out. Unless and until the cost of foreign exchange is meticulously assessed, no programme should be started, since normally the intensity of import substitution is very high. It is, therefore, of preponderating importance to identify fields in which import substitution would yield fruitful results. Keeping in mind the availability of foreign exchange, attempts should be directed towards areas in terms of potential requirements. Doubtless, it would be improper to rely

on imports as far as certain sensitive areas, which are vital for national security, are concerned. The most advisable and appropriate approach must be to make the best use of the factor endowments and resources in the economy to accelerate the pace of industrialisation, even leading to export expansion.

It is a well known fact that initially the returns arising from the import substitution policy based on protection of tariffs or import restrictions may not be efficient, as the substitutes thus produced would be marketed under monopolistic conditions because they will be manufactured in rather small quantities owing to the limited size of local markets. One should not be misapprehensive about this constraint.

Through changes in technology it would be possible to make use of the alternatives. For example, synthetic fibre has been able to replace imported cotton or wool. Indigenously produced aluminium is being increasingly used instead of imported copper in electrical industries. Attempts are being made to replace imported zinc oxide and white lead by composition based on titanium dioxide.

Import substitution does not mean we should completely do away with imports. Developmental and maintenance imports are a must to have increased capacity utilisation and overall accelerated pace of industrialisation. This indispensable import iself would be instrumental and conducive for effecting import substitution, since the goods manufactured with the help of these imported materials could be substituted for the finished products which would otherwise have been imported[10].

Import substitution will reduce the country's dependence on imports and the resultant savings of foreign exchange can be utilised for financing the import of essential commodities in short supply. This judicious approach would go a long way in inducting in the economy the built-in mechanism and high sense of proportion in utilising the scarce resources most efficiently as well as effectively[13].

It should be remembered that initial low productivities in manufacturing activity are only the cost of learning. Low productivities in any event, are neither unique to import substituting industries nor are caused by them. They are ubiquitous and a fact of life in all the less developed countries.

For instance, note the low yields per acre per man in most of the Third World agriculture. There is no point in isolating import substituting industries as the only ones with low productivity and further assuming that abandoning them will somehow enhance productivities.

Imports have largely helped a number of countries in their growth process. But import substitution has hastened the economic growth of various under-developed countries.

With a view to expanding domestic markets and helping sustain a satisfactory rate of industrialisation, it is necessary to make use of import substitution strategy, although it may not be adequate. Import substitution will go a long way in obtaining higher incomes and promoting exports if it is well conceived and adequately implemented. It can also expedite the process of transition of traditional and agrarian economy into an industrial society reaping the benefits of international relations and trade. Keeping in view the fact that the import substitution does not normally extend enough domestic demand to have a high rate of growth, it is essential to reconcile this strategy with a judicious programme of

export expansion. As such, not discontinuation but revision of the import substitution strategy is called for. Such a well-integrated and executed strategy can accelerate the pace of industrialisation and generate higher incomes. Promotion of particular industries and products within the framework of a long term industrialisation strategy is a must. This novel approach would help in proper utilisation of opportunities imparted by import substitution. As also, it will create a flexible process resulting in the penetration of export markets[7].

It is all the more essential now, in the context of skyrocketing and zooming prices of petroleum products, to resort to the process of import substitution. The latest crude oil price hike by the oil producing and exporting countries (OPEC) is causing a grave concern to one and all - the developed as well as the developing or underdeveloped countries alike. Mr. Bahugana, the then Union Minister for Petroleum and Chemicals, observed that in 1977 oil prices averaged $ 12.70 per barrel. After the latest price increase by OPEC, imported crude could cost $ 21 per barrel on an average. He further indicated that every effort was being made to maintain a high

level of production at national oil fields, and as at present 11.50 million tonnes of crude was being produced indigenously. It would be noted that the total crude requirement was around 28 million tonnes. This would mean 16.50 million tonnes of crude was required to be imported this year (1979). Besides, over 4 million tonnes of oil products were also to be imported. By and large, it would be seen all the refineries were working smoothly. It is feared that the foreign exchange outgo will be to the tune of Rs.1,200 crores as a consequence of further hike in petro-goods prices. Thus, there is a tremendous potential for import substitution in this sphere. This would amount to saving a fairly large sum of foreign exchange[4].

The global dimension of import substitution through adoption of an import saving device or strategy in the light of crippling oil and energy crises arising out of menacingly widening imbalance in supply and demand as well as zooming prices of crude and petroleum products in the world market, needs no overemphasis. The European Economic Community, America and Japan have, albeit belatedly, come to realise the dire and crying need to prevent

the world from swaying towards a large scale crisis and prudently as well as discreetly decided to curtail their respective oil consumption forthwith. The Common Market countries have been making all-out efforts to keep the volume of their annual oil imports between now and 1985, at or below, the same level as last year. In 1978 the Community imported about 480 million tonnes of oil. America has made a decision to limit its oil imports to the current year's adjusted target (e.g. 8.5 million barrels a day). For a developing country like India a well studied and realistic policy for conservation of oil is long over due. The need of the hour is optimum fuel efficiency and consumption. The expertise in the Ministries of Petroleum and Chemicals and Energy can be pooled in evolving an energy policy. The expertise and experience thus attained would indeed be immensely conducive for ushering in an element of self-confidence and self-reliance in the industry[5].

Interestingly, as we all know, President Carter has gone on record saying time and again that he would adopt measures to curb effectively to start with and eventually dispense with the import of oil from the monopoly Organisation of Petroleum Exporting

Countries (OPECs). Thus, even the richest capitalist country is seriously preoccupied with the idea of being self-reliant and self-sufficient by taking a resort to import substitution strategy. The envisaged 5-year projection of what should be the import substitution for the oil problem gets all the more accentuated in the light of the impending or imminent Presidential Elections in America. In fact, this approach is of far-reaching significance. As such, the economic policy brings in its train the practical and pragmatic political acumenship having been used as a tool to win the most covetous and lucrative position of the President of the United States of America. President Carter is, thus, in a bid to make a political capital out of this import substitution strategy. This strategy has obviously spread its tentacles in all sorts of economic systems, even the capitalistic system!

The overwhelmingsly important import substitution strategy has been coming to light more prominently these days in view of spiralling prices and galloping global inflationary tendencies in all fields. As a sequel, almost every government is noting with grave concern the alarming condition. The

immediate measure that comes to mind instantly is that of import substitution to get over this difficulty. The Government of India has decided to set up a committee under the chairmanship of Mr. S.M. Agarwal, former Secretary to the Ministry of Communications, to review technical, economic and fiscal policies for the promotion of import substitution and recommend suitable policies for greater self-reliance in the industrial sector. It would further review the progress of import substitution in important manufacturing facilities, including the capital goods industry and to suggest measures for further indigenisation. It would also examine the effect of the liberalisation of the industrial licensing policy and import and export policies on the programme of import substitution and recommend measures for the development of indigenous technology and manufacturing capability within a time bound programme[3].

It is all the more justified to have a resort to and fall back upon the import substitution strategy in view of the fact that oil is not only costlier but there is acute paucity of petrol - a sine qua non for speedy and efficient transport and communication. Guindy Engineering College, Madras, has successfully

converted a car engine to run on ethyl alcohol instead of petrol. It is also noteworthy that the cost of the conversion works out to only Rs.650/- per unit. Taken up on a large scale, the cost may even further decline. Earlier, an agricultural tractor diesel engine was modified to run on a mixture of diesel and alcohol. Owing to rise by one-third in the cost of imported crude oil, there is no way out but to have all-out alternative indigenous sources of energy. Alcohol is becoming a cheaper and better alternative substitute to crude oil. India has surplus of sugarcane which is the most suitable raw material for conversion into power alcohol. It has also plenty of grains, potatoes and agricultural waste materials, being additional sources. Other countries, like Brazil, have already commenced fuelling their motor transport by the mixture of petrol and alcohol. Such a step on the part of India, tapping the indigenous resources, is urgently called for[12].

The justification for import substitution will be further accentuated if it is supported by some concrete examples. Therefore, in passing, a few of them are indicated below that merit due attention.

5.4. Merits

The advantages accruing from the adoption of the import substitution strategy can be hardly overemphasised. There is not a single field of economic, social or political activity where the fruits of import substitution have not left an indelible impetus, directly or indirectly. Magnificient social transformation has come about leading people to be self-reliant and a buoyant built-in mechanism of dyanmic overall industrialisation with the available resources has entrenched itself in the system, thereby setting a healthy trend of prosperity of the country as a whole. The public, private and co-operative sectors of our mixed economy have been reaping the rich dividends from the policy of the import substitution as advocated, formulated and executed by the Government of India.

There is over-riding significance attached to import substitution in the defence sphere, as apparently the processes have got to be the "closely guarded secret". Slightest leakage would amount to and sound the very death knell of the country itself. A considerable part of our import bill goes for the import of defence requirements and hence

this is a potential field for indigenous production of the imported items. The Union Defence Ministry decided to go in a big way towards import substitution of military hardware. Private manufacturers are also furnished facilities who come forward to undertake the work. Sample Rooms have been opened at Delhi, Bombay, Calcutta and Madras where samples of imported articles are displayed. Guidance is given by the Ministry's inspection staff and assistance is assured in the procurement of scarce and controlled raw materials and for obtaining import licences for balancing equipments. The entrepreneurs must take full benefit of these facilities and keenly participate in a large measure in the national drive for import substitution in defence.

In fact, in import substitution a vital role is assigned to development of technological or technical know-how and well planned and organised scientific research supported both by government and private industries. The achievement of national laboratories and scientific institutions should be seen in this context and perspective. Their working should be so oriented that the process of import substitution should be accelerated. Widest publicity should be

and is being given to the research results which would enable and is enabling the entrepreneurs to get the advantage from this.

It would be interesting to notice that the impact of import substitution in various economic activities has indeed been quite impressive. For example, the indigenous development of agricultural inputs like pesticides, weedicides, implements such as tractors, nuclear technology, infrastructures such as automobiles and generators are the shining examples of the great advantages arising out of the implementation of import substitution strategy.

Industrial import substitution is also a conscious national developmental strategy for the sake of industrialisation itself, foreign exchange conservation, employment creation, long term income maximisation or all of these simultaneously. There was enough local market for manufactured consumer goods. In fact, import substitution emanated from these goods being instrumental in increasing the pace of industrialisation. Thus, import substitution has been a pace-setter of industrialisation, bringing in its train the attendant economic benefits to the society at large.

However, albeit there are obvious advantages from import substitution, nevertheless it is necessary to have certain guidelines which would be of immense use to overcome the roadblocks that might hinder formulation as well as implementation of the import substitution strategy.

5.5. International norms

As we have observed, the import substitution strategy is not a fool-proof strategy. It is a double-edged weapon or device which needs to be wielded extremely meticulously and cautiously, lest it might have a snowballing effect. It is bound to have some lacunae. It is one of the strategies to augment the pace of industrialisation. Everything is related to everything, according to Einstein's Relativity Theory. Naturally, there has got to be in existence international trade, as otherwise no thought of prosperity could even touch our mind. The interdependence is the very essence of life. As such, in order to see to it that the import substitution strategy has the spectacular success, certain norms or standards have got to be laid down. In this context, therefore, some international standards to make the import substitution process an effective

and efficient system are enumerated below.

Our products must be in no way inferior to global standards, so that export promotion could as well be fostered, of course, after meeting the indigenous demand.

The development of industrial economy brings in its train the necessity for increasing imports both on account of maintenance imports and for reduction of the widening technological gap between the developing and developed countries. It is, hence, of preponderating significance that adequate resources are generated to effectively meet the increasing inevitable and imperative import bills. This fact needs to be taken into account and the problem resolved.

Continuous efforts are being made even in advanced countries like America to explore avenues for reduction of imports. It is, therefore, of utmost importance that developing economies should strive hard to save the expenditure on imports. Import substitution naturally is of over-riding importance in this direction.

Identification of the areas where immediate total import substitution is possible and areas where import substitution could be accomplished progressively and vigorously over a period of the next few years in a well planned and phased manner and earnest all-out efforts made to create technological know-how through the constant research and development[1].

The problems or implications of import substitution are not without any solutions as such. In fact, it has been noted with gratification that, if judiciously used, the strategy of import substitution is unique in itself. Of late, it has assumed global dimensions and international agencies like General Agreement on Tariffs and Trade (GATT) are seriously considering ways and means to fight protectionism for achieving durable external equilibrium. In other words, the judicious use of import substitution strategy in international trade is advocated. In the forthcoming Chapter (VI) an humble attempt has been made to carry out "empirical studies in select chemicals" to evaluate the role of import substitution in chemical industry in the light of their imports and exports in terms of quantity and value over a quaternary period constituting four fiscal years 1973-74 to 1976-77.

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VI-CHAPTER

EMPIRICAL STUDIES IN SELECT CHEMICALS

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EMPIRICAL STUDIES IN SELECT CHEMICALS

6.1. Preamble

A modest preliminary digging has been done in this study to evaluate the gap between export and import. For this purpose a quaternary period between 1973-74 and 1976-77 has been chosen. So also twelve chemicals of strategic significance having agro-food or agro-based chemical industry orientation have been selected. Main reliance has been placed on the statistical data vailable in the respective issues of "Monthly Statistics of Foreign Trade of India" for the fiscal years ending 31st March 1973-74 to 1976-77. The data pertain to the quantity in kg and value (in rupees) of chemicals as well as countries to and from whom exported and imported respectively. The gap between export import reveals vividly the inherent import substitution potentials for producing these chemicals indigenously.

6.2. Chemical industries and their products

There is considerable contribution made by chemical industry in food grains production with a view to have continued self-sufficiency in this

direction. Besides, it is increasingly helping to quicken the pace of self-reliance in other equally important fields e.g. clothing, shelter, machines, engineering, paper, cement, sugar and glass. This industry, doubtless, is on the threshold of introducing the "chemical age in India". Further, efforts are on, in this industry, to set up new large and medium scale units in order to start manufacturing new and sophisticated items, existing units having been expanded to maximise production. Recent trend is towards rapidly enhancing the production of chemical and allied products and their consumption. Large units have been set up with a view to produce those items which were hithertofore imported, thus putting a damper on the drain of foreign and to that extent saving the valuable foreign exchange.

Substantial strides have been made in India during the past few years in the manufacture and acceleration of the production of chemicals such as: nitrogenous/phosphatic/potassic fertilisers, soda ash, sulphuric acid, sodium hydro-sulphite, phenol, nitrobenzene, aniline, acetic acid, thermoplastic resins, polystyrene, PVC, DMT, synthetic rubber, nylon, filament yarn, nylon tyre cord,

polyester staple fibre, polyester filamant, acrylic fibre, pesticides, insecticides, fungicides, industrial explosives, industrial gases, aluminium fluoride, carbon black synthetic detergents, soap, glycerine, calcium carbide, formaldehyde, potassium chlorate, sodium chlorate, acetylene black, zinc sulphate, activated carbon, dyestuffs, all types of drugs and pharmaceuticals and fine chemicals, petrochemicals, synthetic chemicals as well as catalysts[4].

6.3. Chemicals selected - relevant data

As we have noted, the chemical industry touches almost every aspect and walk of life. There is hardly any sphere where it does not come to the fore in some way or the other. However, with a view to making a study of this industry, a few chemicals have been chosen. It will be seen that thrust is laid on such chemicals as would be drifting or leaning towards the agro-food or agro-based industries. They have immediate and urgent application potential. Some of them could as well be said to be of immense use as agricultural inputs. As such, their importance in the present day socio-economic set-up is all the more felt and elevated. The chemicals that have been selected are given below:

(1) Yeasts (natural)

(2) Methanol (methyl alcohol)

(3) Ethylene glycol

(4) Monochloroacetic acid

(5) Dibutyl phthalate (DBP)

(6) Dioctyl phthalate (DOP)

(7) Citric acid

(8) Lactic acid

(9) p-Toluidine

(10) Aminoacetic acid

(11) Acetanilide

(12) Epsilon caprolactum

On each one of the above chemicals a brief outline is contained in the following so as to know their relevance and significance.

(1) Yeasts (natural)[12]

Albeit yeast was used for thousands of years for making bread, wine and beer, its real nature was known only when Leeuwenhoek in 1680, with the aid of his newly invented microscope, for the first time observed yeast cells in fermenting liquids. The most widely accepted definition of yeast is that the yeasts are true fungi which in standard

growth form reproduce hyaline, uninucleate, unicellular individuals that may be pigmented yellow, orange or red.

Depending upon the industry they serve, the yeasts are grouped as brewer's, distiller's, rum, wine, champagne, baker's, food, feed yeasts, etc. Sometimes a sub-division is made to conform to the raw material utilised - distiller's yeast may be classified as grain, potato, molasses, sugar beet, fruit, brandy yeast, etc. and grain yeast may be further sub-classified as bourbon, corn, rye, milo yeast, etc. Various strains of the same species may even be placed in different groups, and one group may include several species. By the ability to ferment sugars they may be called "strong fermenters", "weak fermenters" and "non-fermenters". The following table gives the use of yeast and yeast products.

Use of yeast and yeast products

Type	Use
(1)	(2)
(A) Primary yeast	
(1) Compressed baker's yeast	Bread and bakery products
(2) Active dried yeast	-do-
(3) Compressed wine yeast	Wine
(4) Compressed distiller's yeast	Distd. alc. beverages
(5) Food-grade dried yeast	Food ingredient
(6) Food or feed yeast	Food or feed ingredient
(B) Secondary yeast	
(7) Brewery dried yeast	Food or feed ingredient, pharmaceuticals
(8) Distillary dried yeast	Food ingredient
(C) Products made of yeast	
(9) Pharmaceutical products (ergosterol)	Medical
(10) Yeast extract	Food
(11) Invertase	Food
(12) Glucose isomerase	Food

(1)	(2)
(D) Products containing yeast	
(13) Distiller's dried grains	Food, microbial fermentations
(14) Brewer's dried grains with yeast	Feed
(15) Whey yeast, with whey proteins	Food, feed

A cursory look at the above table would distinctly divulge the over-riding significance of the yeasts in day-to-day life of a man. The technology involved in production of the yeasts is mainly related to fermentation. In areas with undernourished population, food yeast plays an even more important role than baker's yeast. It solves the nutritional problems.

(2) Methanol (methyl alcohol)[13]

It is a colourless, mobile, inflammable liquid of characteristic, pleasant odour when pure. It is miscible in all proportion with water. It arises in the destructive dry distillation of wood,

and is said to be present in small quantities in all fermented liquors. In the form of wintergreen (methyl salicylate), it is found in plants.

It may be produced from the dry distillation of wood, from the waste water of steamed wood pulp in paper manufacture, by the partial oxidation of methane and by the catalytic reduction of oxides of carbon. It also arises in many organic reactions by processes common to all aliphatic alcohols.

Its utility in various industries needs no overemphasis.

(3) Ethylene glycol[10]

It is the simplest and most important of the glycols. The most important use of ethylene glycol is as a non-volatile permanent-type anti-freeze for liquid-cooled motor vehicles. It is the active ingredient of aircraft deicing fluids which are now very vital to military and commercial air operations. The anti-freeze properties of ethylene glycol also make it valuable for use in a number of other products needing freeze-thaw protection. Inhibited ethylene glycol can be used as a high-temperature coolant for internal combustion

stationary engines, snow-melting systems, industrial heat-transfer fluids and refrigeration systems where corrosion by brine solutions is a problem.

It is also used in modern automotive brake fluids. It is an important component of the fire-resistant water-glycol hydraulic fluids (hydrolubes) originated by W.A. Zisman of the Naval Research Laboratory. Large-volume uses of ethylene glycol are to be found in the manufacture of alkyl resins; solvent systems for paints, varnishes and stains; in polyester fibers and explosives.

(4) Monochloroacetic acid[9]

It is increasingly used as an intermediate in the preparation of a wide variety of organic and inorganic compounds. It was first prepared as the necessary raw material for the synthesis of indigo and related dyes. It has been suggested for the identification of phenols and naphthols as crystalline aryloxyacetic acid derivatives. It is widely used as the necessary intermediate in the manufacture of (1) selective weed killers such as 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), (2) thiocyanate

insecticides, (3) ammonium thioglycolate (used as a cold-permanent wave solution) and (4) pharmaceutical preparations. Medicinally, small amounts have been employed directly as a caustic and vesicant for the removal of warts, corns, etc. The industrial grade (95%) is suitable for most laboratory uses whereas the technical grade (98.9%) is required for pharmaceutical purposes.

(5) Di-butyl phthalate (DBP)[1]

Di-butyl phthalate, or DBP, is an important plasticiser used in the plastics and lacquer industries. It is a stable, light-fast easter, colourless, with a faint fruity odour. It is also used as an insect repellent.

Albeit very stable at normal temperature, it decomposes at its boiling point, when phthalic anhydride is among the decomposition products. It is sometimes used as a secondary plasticiser in cellulose acetate injection and extrusion compounds to aid flow at higher temperatures, when it is a better solvent.

Its most important application has been as a

plasticiser for polyvinyl chloride and polyvinyl chloride/acetate copolymers. It is a useful medium for grinding pigments. It is considered sufficiently non-toxic for all general applications.

(6) Di-octyl phthalate (DOP)
(Di-2-ethylhexyl phthalate)[2]

It is a plasticiser which has achieved great popularity both in America and in Great Britain. It is a stable, pale yellow oily liquid, with a characteristic odour. It possesses extremely low volatility, is only very slightly water-soluble and has good resistance to hydrolysis. It has the quality of having good electrical properties, essential for cable manufacture and is considered non-toxic for all general requirements. Viscosity also shows a comparatively low rate of change with temperature, a most important property where flexibility of the plastic is concerned. It is particularly useful in cable coating compositions because of its favourable dielectric constant and power factor. DOP plasticises other vinyl resins and is recommended for cellulose nitrate with which it forms tough flexible films. It is also compatible with polystyrene. It is a solvent for many natural resins and is of value in lacquer formulations.

(7) Citric acid[8]

The food and pharmaceutical industries utilise citric acid extensively in view of its high solubility, pleasant sour taste, very low toxicity, ready assimilability and availability at low cost.

It is used in the food industry for manufacture of candy; desserts; jellies, jams and preserves; soft drinks and syrups; fruit and vegetable juices; wines, etc. It is also used in cosmetics for preparation of hair rinses and setting fluids as well as lotions. It has other industrial applications e.g. metal cleaning, rust and scale removal, chemical cleaning, electropickling, copperplating, secondary oil recovery, tanning, bottle washing compounds and printing. It has varied miscellaneous uses. For instance, it is the starting point in the manufacture of various esters and of the citrates of sodium, ammonium, bismuth, calcium, ferric iron, lithium, magnesium, manganese, potassium and strontium. It is also of use in ink eradicators, floor cements, linoleum, inks, silvering compounds and algicide formulations as also in the dyeing of fabrics, in the stabilisation of peroxides and in the processes for removal of contamination of radio-active isotopes.

(8) Lactic acid[11]

The main uses for lactic acid are in foodstuffs. It also has various non-food industrial uses of significant interest. Relatively it is non-volatile and practically odourless. However, it has a pleasant mild acid flavour making it a good acidulant when used in combination with aromatic materials in foods and beverages. It is a relatively strong acid and has good preservative powers in sanerkrant, pickles, olives and similar acid-preserved foods. It can be commercially distributed in liquid form, thus being ready for use. One or more of these properties have contributed to the increasing use of edible-grade lactic acid in animal food and remedies, bakery products, beer, butter, candy, cheese, dried egg whites, flavouring extracts, jelly, liquid pectin, mincemeat, soft drinks, soups and sherbets.

It has been reported to be an effective air-borne bactericide. In the crude form it has long been in use in the leather-tanning industry as an acidulant for deliming hides, in vegetable tanning and in the acid dyeing of wool and other textiles. Other non-food uses include applications in adhesives, cleaning and polishing formulations, electroplating

and electropolishing, insecticides and fungicides, lithographic developers, plastics and resins, special inks, textiles and the treatment of oil and water wells. It is also used in the pharmaceutical field as calcium lactate for calcium therapy. The newest major utilisation of lactic acid is in the production of polymers and various fatty esters of lactic acid to be used for the improvement of dough.

(9) p-Toluidine[7]

o-, m- and p-Toluidines are the three isomeric toluidines prepared by reduction of the corresponding nitrotoluenes with iron and dilute acid or by the catalytic hydrogenation of nitrotoluenes. p-Toluidine is a solid appearing as white lustrous crystals, soluble in dilute acid and organic solvents. It is used in organic synthesis and in the production of many dyes, which include Basic Red 9, Acid Green 25 and Acid Blue 78.

It is, thus, widely and mainly used in the manufacture of numerous dyes.

(10) Aminoacetic acid (glycine)[6]

It is one of the amino acids. Eight amino

acids, methionine, tryptophan, lysine, isoleucine and leucine, phenylalanine, threonine and valine are strictly indispensable to man. However, the remaining amino acids, by supplying undifferentiated nitrogen, are useful in that they appear to act as extenders for the essential amino acids. This is particularly true of glycine, which is the other nomenclature for aminoacetic acid, that is a precursor and often also of glutamic and aspartic acids.

Glycine molecule has a particularly short chain. It is a precursor of serine and of other amino acids, of peptides (glutathione), of proteins and of the purines and porphyrins, by virtue of the fact that it condenses with two residues of succinic acid and via the mediation of delta-aminoleulinic acid. These reactions have been verified by the use of tracers. Glutamic acid is used for therapeutic purposes. Sodium glutamate is widely used in industry to reinforce the taste and flavour of food products, specially of proteolyzates.

It is, thus, observed that aminoacetic acid, known also as glycine, has a tremendous application, since relatively large proportions of natural proteins are made up of aspartic and glutamic acids,

glycine being a precursor of these acids.

(11) Acetanilide[5]

Acetanilide is used as an antipyretic and analgesic. It is used as an anticeptic which is employed in the manufacture of dye intermediates, p-nitroacetanilide, p-nitroaniline, p-anilinediamine, p-phenylenediamine. During World War II considerable quantities went into the manufacture of acetylsulphanilyl chloride. It is used in the preparation of thioacetanilide. It is used as stabiliser for hydrogen peroxide and for cellulose. It is used as an additive in cellulose ester type lacquers and as rubber accelerator.

(12) Caprolactum : Polymer (6 Polymer)[14]

This has been manufactured in Germany on a considerable scale under the name of "Perlon L". In this case there is no water of condensation, so that the process is readily adaptable to continuous working. 80-90% aqueous caprolactum is pumped through an 8-metre tube filled with 6-8 trays to evaporate the water. The molten polymer is extruded at the base. The process does not go quite to completion, and at equilibrium about 10% caprolactum

remains unpolymerised. This has to be washed out at the chip stage to make the polymer spinnable. For some purposes it has to be washed out again in the fibre stage since it re-forms to a certain extent during spinning. It does have the qualities of flexibility, strength and toughness as are found in natural fibres.

The synthetic yarn substituting the natural one, these days, is getting great impetus, as we notice.

6.4. Studies in the light of import substitution potentials of the select chemicals

As has been distinctly revealed, the chemicals are of paramount significance. In order to evaluate the trend of import and export of these chemicals, a study has been conducted with regard to the country or countries to which these chemicals have been exported and from which these are imported in terms of quantity and value. A quaternary period between 1973-74 and 1976-77 has been chosen, there being the fiscal years (April-March)[3]. The appended eight tables (1-8) throw ample light on the aspect of the study.

In order to simplify the study, these tables have been converted into two tables comprising the total year-wise figures of exports and imports respectively in tables 9 and 10 during the above quaternary period. As from the above 8 tables, exhaustive details could be had. A glance at the condensed tables gives a broad picture pertaining to the gap between the export and import of the respective chemicals.

Yet furthermore abridgement of the condensed tables indicates the total quantity and value of the chemicals (exported and imported) for the above four-year period (table-11). It is clear from this table that there existed an overwhelming gap between export and import in terms of both quantity as well as value of almost each one of the above chemicals.

Curiously, there was hardly 16600 kg export of yeasts valued at Rs.9969 at the fag end of the period (1976-77). As against that, there was a huge import of this product throughout the entire period. The quantity imported was to the tune of 27002 kg at Rs.703752 throughout the above four-year period. Since just within a year 16600 kg of this product was exported, obviously, there was an immense

potential for this item for export. As such, efforts need to be directed towards generating enough capacity for this. This has profound utility in preparation of numerous items of day-to-day use. Hence, our enhanced capacity for production of yeast would certainly go a long way in fetching us the most sought after valuable scarce foreign exchange.

As regards methanol or methyl alcohol, there were no exports during intervening two-year period (1974-75 and 1975-76), whereas in the remaining period of two years (1973-74 and 1976-77) 5233 kg valued at Rs.25865 were exported. The import of this chemical amounted to as high as 28710533 kg at Rs.32496730. Its use in various industries needs no special stress.

With respect to ethylene glycol, there were no exports effected during this entire period. As against that, the imported amount was 6156383 kg at Rs.2877958l. This chemical is of utmost use in polyester fibers and explosives in addition to its other multifarious uses in different spheres.

Monochloroacetic acid, increasingly used as an intermediate in the preparation of a wide variety

of organic and inorganic compounds, was exported to the tune of 79900 kg at Rs.903486 during the first two years (1973-74 to 1974-75) only, whereas the import content again only for two years but intervening ones (1974-75 to 1975-76) was 19959 kg at Rs.174826.

Di-butyl phthalate (DBP), an important plasticiser used in the plastics and lacquer industries, was exported (25 kg at Rs.450) only during the year 1975-76, and imported to the tune of 10000 kg valued at Rs.43438.

Di-octyl phthalate (DOP), again a plasticiser like DBP having good electrical properties essential for cable manufacture, was exported only in the very first year of our study period (1973-74) amounting to 360000 kg at Rs.3175203 as against an import of 307026 kg at Rs.1730371 throughout the four-year period.

Citric acid, finding a very extensive use in food and pharmaceutical industries, was exported during three years beginning 1974-75 to the tune of 1650 kg at Rs.27771 vis-a-vis an import of 4179641 kg at Rs.43798640 all through the four years. At present there are apparently sizeable gaps between

demand and supply. As such, there is considerable need to bridge these gaps by going in for manufacture of this important chemical indigenously.

Lactic acid, mainly used in foodstuffs, was exported only in 1974-75 amounting to 9046 kg at Rs.64535, whereas it was imported throughout the quaternary period (75477 kg at Rs.719359).

p-Toluidine, used in organic synthesis and in the production of many dyes, was not exported at all, the import content being 2614 kg at Rs.152216 only for a year in 1975-76.

Aminoacetic acid (glycine) is useful for therapeutic purposes. No exports of this acid were made at all. However, it was imported throughout the period (81266 kg at Rs.1004646).

Acetanilide, principally used as an antipyretic and analgesic, was not on the list of chemicals that were exported during the period of four years under study. It was imported only for two intervening years (1974-75 and 1975-76) amounting to 82600 kg at Rs.830718.

Lastly, epsilon caprolactum, a perfect substitute for natural fibre, also did not find its place in the export list. A huge amount of 7686000 kg was imported at Rs.74438464 throughout the period. Even now, as at present, it is being imported currently. Reportedly, the Government of India have decided to allow actual users to import this chemical under open general licence (OGL) recently vide an announcement "Caprolactum Imports Allowed Under OGL" appearing on the very front page of Financial Express dated July 31, 1979. The Gujarat State Fertiliser Company is the sole domestic producer of this critical raw material, which needs to be not merely protected but even boosted up. And rightly Government is endeavouring its best to do so.

In sum, it could be safely concluded on the basis of the statistical figures at our disposal indicated in various forms in terms of value and quantity that there is ample scope for establishing our own capacities for all the above important chemicals. It would be seen that there are huge imports of almost each one of these chemicals that we badly need for our use. In fact, the manufacture of these chemicals would happily result in saving on the

imports, in other words correspondingly having an effective check and control on the outgo of the valuable foreign exchange, to that extent circulating the money within our economy itself, making it increasingly stronger, sturdier and healthier.

In particular, it comes to our immediate attention that ethylene glycol, p-toluidine, aminoacetic acid, acetanilide and caprolactum were consistently and persistently imported having not been exported at all. This would purport to mean that there is a great potential for indigenous manufacture of these chemicals of urgent necessity. These could substitute effectively the imported ones. Further, steadily planned enhanced production could as well help us in visualising exports, thereby exploring and exploiting the avenues for augmenting our foreign exchange reserves, in turn accelerating the pace of industrialisation.

Next to these five chemicals, the rest, in order of their export contents in terms of value, could be, di-octyl phthalate, monochloroacetic acid, lactic acid, citric acid, methanol (methyl alcohol), yeast and di-butyl phthalate. Here again, there is a tremendous potential for going in for import

substitution. Besides, it is also a happy augury that already there have been certain established capabilities and capacities on our part to entrench ourselves in the international market. Some more concerted effort is all that is needed to make a headway in stepping up our capabilities commensurate with the requisite requirements with regard to capacity creation and its utilisation so as not merely to be self-reliant but even to extend help to others through export. This would make our position comfortable on the foreign exchange front. In other words, this would take us long in increasing our resources in every possible way - skill, know-how, man-power, machinery, material, experience, expertise and consultancy.

The list of chemicals chosen here is of paramount significance, in that it would be prominently noticed that these chemicals are mainly agro-based. As at present, we need to augment our resources so as to enhance our production principally in the agricultural sector. This would create ample employment opportunities to our rural people seething in superstition and ignorance as well as illiteracy coupled with abject poverty. Further, an increase in

the production of these chemicals would create a team of well trained technicians, appropriate technological base and expertise. These expertise and experience gained over a period of time at a collosal cost to the public exchequer could be effectively and efficiently utilised in other similar undertakings, adeptly obviating or eschewing the pitfalls that had been confronted in the above exercise.

Table-1

India's exports by commodities-countries

Articles and countries	April 1973 - March 1974	
	Quantity (kg)	Value (Rs)
Yeast (natural)	-	-
Methanol		
Zambia	160	1450
Ethylene glycol	-	-
Monochloroacetic acid		
Australia	24990	91173
Di-butyl phthalate	-	-
Di-octyl phthalate		
Sri Lanka	30000	253907
Hongkong	300000	2553969
Japan	30000	367327
	360000	3175203
Citric acid	-	-
Lactic acid	-	-
p-Toluidine	-	-
Aminoacetic acid	-	-
Acetanilide	-	-
Epsilon caprolactum	-	-

Table-2

India's imports by commodities-countries

Articles and countries	April 1973 to March 74	
	Quantity (kg)	Value (Rs)
(1)	(2)	(3)
Yeasts (natural)		
Belgium	3000	44423
Denmark	1247	14557
German F. Rp.	2001	20717
Italy	106	7486
Switzerland	128	5262
UK	1112	13193
USA	902	24251
	8496	129889
Methanol		
UK	12662122	9822621
Ethylene glycol		
Belgium	66605	223657
Bulgaria	44776	152388
France	24688	135509
German F. Rp.	65867	304089
Hungary	69788	255868
Italy	5716	26694
Japan	686919	1438160
Netherlands	128088	474708
UK	515765	1448171
USA	6252	66126
	1614464	4525370
Monochloroacetic acid	-	-
Di-butyl phthalate	-	-

Table-2 (Contd.)

(1)	(2)	(3)
Di-octyl phthalate		
German F. Rp.	37850	141139
UK	1780	14353
Citric acid		
Belgium	629633	3932445
Czechoslovak	492	3708
German F. Rp.	12200	113783
Mexico	100000	549595
USA	100110	587107
	842435	5186638
Lactic acid		
Belgium	1200	9557
France	3000	24069
German F. Rp.	140	1296
Japan	22390	103621
Netherlands	1210	4016
Switzerland	522	3439
UK	2368	12586
	30830	158584
p-Toluidine	-	-
Aminoacetic acid		
Belgium	5015	14671
German F. Rp.	2770	21725
Italy	14960	88612
Japan	4560	60918
Netherlands	250	2696
UK	20	563
USA	27875	198353
	55480	387538
Acetanilide	-	-
Epsilon caprolactum		
Belgium	750000	3060135
Czechoslovak	375000	1800000
German D. Rp.	5000	23500
Hungary	275000	3569280
Italy	500000	3706461
Japan	505962	2130243
Netherlands	225800	1478962
Spain	62980	445919
USA	250000	2895241
	2949742	19109741

Table-3

India's exports by commodities-countries

Articles and countries	April 1974 to March 1975	
	Quantity (kg)	Value (Rs)
Yeasts (natural)	-	-
Methanol	-	-
Ethylene glycol	-	-
Monochloroacetic acid		
Australia	54910	812313
Di-butyl phthalate	-	-
Di-octyl phthalate	-	-
Citric acid		
Kenya	2	22
Bangladesh	1000	13037
	1002	13059
Lactic acid		
Indonesia	6000	39648
Kenya	46	887
Singapore	3000	24000
	9046	64535
p-Toluidine	-	-
Aminoacetic acid	-	-
Acetanilide	-	-
Epsilon caprolactum	-	-

Table-4

India's imports by commodities-countries

Articles and countries	April 1974 to March 1975	
	Quantity (kg)	Value (Rs)
(1)	(2)	(3)
Yeasts (natural)		
Denmark	342	5724
German F. Rp.	584	17032
Japan	282	14289
Netherlands	100	3247
Switzerland	1408	43651
UK	3459	80977
USA	2306	84152
	10481	248622
Methanol		
Hungary	1000	1360
UK	11177544	173343395
	11178544	173344755
Ethylene glycol		
Belgium	51091	345248
Canada	2909	43086
France	15994	124751
German F. Rp.	87883	661402
Hungary	6840	67509
Italy	40000	86677
Japan	127080	363811
Netherlands	2283	31048
UK	154385	1045155
	488465	2768687
Monochloroacetic acid		
German F. Rp.	2999	51995
Di-butyl phthalate	-	-
Di-octyl phthalate		
German F. Rp.	27821	163980

Table-4 (Contd.)

(1)	(2)	(3)
Citric acid		
Belgium	391024	4536614
Czechoslovak	30000	301500
German F. Rp.	81750	1008873
Japan	3875	63473
Mexico	125000	750402
UK	1100	14798
USA	199584	1717596
Yugoslavia	1150	16309
	833483	8409565
Lactic acid		
Belgium	1620	14012
France	1980	16998
UK	390	5815
	3990	36825
p-Toluidine	-	-
Aminoacetic acid		
Japan	4583	86104
USA	1551	8092
	6135	94196
Acetanilide		
Hungary	2600	32734
Japan	20000	205835
	22600	238569
Epsilon caprolactum		
Belgium	1325070	21547137

Table-5

India's exports by commodities-countries

Articles and countries	April 1975 to March 1976	
	Quantity (kg)	Value (Rs)
Yeast (natural)	-	-
Methanol	-	-
Ethylene glycol	-	-
Monochloroacetic acid	-	-
Di-butyl phthalate		
Sri Lanka	25	450
Di-octyl phthalate	-	-
Citric acid		
Kenya	23	207
Bangladesh	425	4610
	448	4817
Lactic acid	-	-
p-Toluidine	-	-
Aminoacetic acid	-	-
Acetanilide	-	-
Epsilon caprolactum	-	-

Table-6

India's imports by commodities-countries

Articles and countries	April 1975 to March 1976	
	Quantity (kg)	Value (Rs)
(1)	(2)	(3)
Yeasts (natural)		
Denmark	779	36445
German F. Rp.	100	1687
Switzerland	2816	104100
UK	360	10413
USA	204	18488
	4259	171133
Methanol		
German F. Rp.	6300	76736
Japan	16210	39138
UK	1100	9848
USA	263	4160
	23873	129882
Ethylene glycol		
Bulgaria	10000	77078
France	585	4646
German F. Rp.	38935	325131
Hungary	25972	284129
Japan	60255	486610
Switzerland	200	5584
UK	14035	102936
USA	7185	52737
	157167	1338851
Monochloroacetic acid		
German F. Rp.	2000	13993
Netherlands	14960	108838
	16960	122831
Di-butyl phthalate	-	-
Di-octyl phthalate		
Japan	1800	3439
UK	2000	25132
	3800	28571

Table-6 (Contd.)

(1)	(2)	(3)
Citric acid		
Belgium	279805	3921888
France	154	2251
German F. Rp.	101450	1118975
Ireland	1550	24833
Italy	25461	37177
Mexico	15400	162237
UK	858	14259
USA	206933	2435998
	631611	7717618
Lactic acid		
Belgium	330	4682
France	270	6199
German F. Rp.	1280	16014
Japan	26212	329284
New Zealand	500	10080
UK	30	955
	28622	367214
p-Toluidine		
Switzerland	2614	152216
Aminoacetic acid		
German F. Rp.	570	23727
Japan	4850	224676
UK	105	3310
USA	52	263
	5577	251976
Acetanilide		
Austria	55000	540879
Czechoslovak	5000	51270
	60000	592149
Epsilon caprolactum		
Belgium	758000	5697971
Czechoslovak	30500	335500
Hungary	50000	390000
Italy	200000	1674208
Japan	946803	11922314
	1985303	20019993

Table-7

India's exports by commodities - countries

Articles and countries	April 1976 to March 1977	
	Quantity (kg)	Value (Rs)
Yeasts (natural)		
Nepal	16600	9969
Methanol		
Nepal	5073	24415
Etnylene glycol	-	-
Monochloroacetic acid	-	-
Di-butyl phthalate	-	-
Di-octyl phthalate	-	-
Citric acid		
Oman	200	9895
Lactic acid	-	-
p-Toluidine	-	-
Aminoacetic acid	-	-
Acetanilide	-	-

Table-8

India's imports by commodities-countries

Articles and countries	April 1976 to March 1977	
	Quantity (kg)	Value (Rs)
(1)	(2)	(3)
Yeasts (natural)		
Denmark	392	24132
German F. Rp.	1396	56830
Switzerland	1280	53763
UK	596	14213
USA	102	5170
	3766	154108
Methanol		
German F. Rp.	4750	52706
Japan	1017	8569
UK	140	1547
USA	4841087	5199472
	4846994	5262294
Ethylene glycol		
Australia	1990	12052
Bulgaria	26000	256957
German F. Rp.	70825	543399
Japan	3040122	15536662
UK	753719	3707537
USA	3721	90066
	3896287	20146673
Monochloroacetic acid	-	-
Di-butyl phthalate		
Spain	10000	43438
Di-octyl phthalate		
German F. Rp.	234480	1351572
UK	1295	30757
	235775	1382329

Table-8 (Contd.)

(1)	(2)	(3)
Citric acid		
Belgium	926138	12079633
German F. Rp.	4182	57886
Hongkong	3000	35548
Ireland	250000	2692998
Italy	22750	331456
Japan	3942	49540
Mexico	200000	2187785
New Zealand	200	18731
Sweden	50	34465
UK	206850	2228993
USA	255000	2767784
	1872112	22484819
Lactic acid		
German F. Rp.	770	8888
Japan	11015	145864
UK	250	1884
	12035	156736
p-Toluidine	-	-
Aminoacetic acid		
Japan	12925	240872
UK	1150	30064
	14075	270936
Acetanilide	-	-
Epsilon caprolactum		
Belgium	357000	3178197
Bulgaria	127000	1397000
German D. Rp.	19980	203796
German F. Rp.	2750	137204
Japan	656780	6301852
Netherlands	262375	2543544
	1425885	13761593

Table-9

India's exports by commodities

Articles	1973-74		1974-75		1975-76		1976-77	
	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)
Yeasts	-	-	-	-	-	-	16600	9969
Methanol	160	1450	-	-	-	-	5073	24415
Ethylene glycol	-	-	-	-	-	-	-	-
Monochloroacetic acid	24990	91173	54910	812313	-	-	-	-
Dibutyl phthalate	-	-	-	-	25	450	-	-
Dioctyl phthalate	360000	3175203	-	-	-	-	-	-
Citric acid	-	-	1002	13059	448	4817	200	9895
p-Toluidine	-	-	-	-	-	-	-	-
Aminoacetic acid	-	-	-	-	-	-	-	-
Acetanilide	-	-	-	-	-	-	-	-
Caprolactum	-	-	-	-	-	-	-	-

Table-11

India's exports and imports by commodities for the quaternary period 1973-74 to 1976-77

Articles	Exports		Imports	
	Quantity (kg)	Value (Rs)	Quantity (kg)	Value (Rs)
Yeast	16600	9969	27002	7303752
Methanol (methyl alcohol)	5233	25865	28710533	32496730
Ethylene glycol	Nil	nil	6156383	28779581
Monochloroacetic acid	79900	903486	19959	174826
Di-butyl phthalate	25	450	10000	43438
Di-octyl phthalate	360000	3175203	307026	1730371
Citric acid	1650	27771	4179641	43798640
Lactic acid	9046	64535	75477	719359
p-Toluidine	Nil	nil	2614	152216
Aminoacetic acid	Nil	nil	81266	1004646
Acetanilide	Nil	nil	82600	830718
Epsilon caprolactum	Nil	nil	7686000	74438464
Total	472454	4207279	47338501	184872741

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VII-CHAPTER

EMERGING PATTERN OF IMPORT SUBSTITUTION

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EMERGING PATTERN OF IMPORT SUBSTITUTION

7.1. Preamble

So far we have had an exhaustive and amply detailed discussion on the aspects of the concept of import substitution as a vitally significant strategy judiciously and effectively utilised to accelerate the pace of industrialisation. It has obviously come to our immediate and urgent attention that the process of import substitution is inextricably intertwined and closely associated with the technical issues besides being an offspring of economic (in terms, for example, of balance of payment) and emotional or sentimental (e.g. self-reliance and self-sufficiency) aspects. It has further adequately attracted and focused our attention on the fact that the strategy of import substitution could be translated into action or reality with the intensive as well as extensive endeavours at augmenting the indigenous capabilities in the sphere of technological developments. It would be observed that this technology, popularly these days being called "indigenous", "relevant", "intermediate" and "appropriate", is gaining in swift currency and preponderating significance. It is inherent in this

technology that concerted and determined attempts are made to make the fullest possible use of and to adequately exploit the indigenously available resources in terms of skill, man-power, raw materials, money, energy, expertise, experience, equipment and machinery. This goes a long way in stepping up the built-in mechanism to generate surging self-confidence in both the entrepreneurial class as well as the customers. There has been a steadily increasing trend of and upswing in enhancing the research and development activities so as to have enough capacity for creating, harnessing, fostering, sustaining and further raising the capability in the development of indigenous technology. It is this technology which should be technically feasible, economically viable and commercially attractive and exploitable. Not merely it should be capable of effectively meeting the pent up local domestic demands, but there should also simultaneously emerge proper potential for generation of stiff and keen competence in the sphere of international trade.

In the following a modest endeavour has been made to carry out an indepth and incisive study with a view to appraising the adequacy and efficacy

of the indigenous, appropriate, intermediate or relevant technology and the potentials for import substitution principally in the light of the data as available from the awards announced and given away by the Government of India under the "Import Substitution Award Scheme". In this context, to start with, it is imperative to have a proper feel of the problems pertaining to the term "technology". This aspect has been dealt with in the following pages to have the concept clear to our mind.

7.2. Meaning of technology

It is widely and ritually repeated these days that a technological world is a world of change. Change is thus inherent in technology. This would lead to creation of new possibilities or innovations or inventions. It will lead to the alteration in the mix of choices, changes in social values. It will diffuse knowledge[9].

There are a host of myriad explanations in different contexts (e.g. production, productivity, expertise, socio-economic, scientific, techno-economi ecological and psychological) as to what technology means. A few of the popularly known journalistic

statements have been given below with a view to have an understanding with regard to the meaning and content of the concept "technology".

Technology is useful knowledge pertaining to the art of production. It is an input and that is reflected in the output. So the acid test of any technology is naturally its output

Technology is a body of knowledge and devices by which man masters his natural environment. It is not synonymous with applied science, being more empirical in its approach to solving problems. Technology is the direct master of applied research. Each technological advance by its very nature must disturb the economy to a certain extent. The pollutions of various sorts, as a consequence of ushering in of new technology, have made life miserable nullifying the beneficial trends set in motion by technology improving production, productivity, effectivity, efficiency and comfort.

Technology is society's pool of knowledge regarding the industrial arts. New technology is inherent in the concept of control to maintain the equilibrium between ends and means, output and effort.

The more advanced the technology, the more fragile it can be. Whatever the advance, there is always a price to pay for it. Fortunately, for progress, human beings are willing to take the chance.

Technology is inextricably bonded with industry. It has often been said that industry is the key to progress and technology is the key to industrialisation. No nation that speaks of progress is without its destiny linked up inexorably or truculently to industry.

Curiously enough, Bob Carins, accepting the Industrial Research Institutes (USA) Gold Medal in 1974 said: "Technology is not science. Technology policy is not science policy. Technologists are not scientists!" It is true that technology usually has a scientific basis, but it also has economic, legal sociological, engineering and medical bases as well and, of late, ethical and aesthetical bases, too. Technological problems do not come packaged in a size that one person or one discipline alone can tackle. It is inter-disciplinary. The technological and scientific revolution has brought in its train and generated an unprecedented acceleration in the development of productive forces and created the

possibility of sharp rise in the standard of living.

Technology is closely connected with science and scientific research. Technology pertains to "know-how". It is inherent in maximum output with minimum input; or more output with the same input or same output with less input. Science is related to "know-why". It is directed towards understanding, whereas technology towards use. Criterion of success in technology is ultimately that of the market. Whether the new idea is a commercial asset or not, the final judgement here is exercised by the customer or consumer.

Technology can be divided into two parts: (1) invention and (2) development. Invention is something that comes before development. Inventors are not necessarily good developers and even if they were, they could not always afford the cost of development which can often be prohibitive. Development is a term which is loosely used in general discussion to satisfy the three main conditions: (a) development is the stage at which known technical methods are applied to a new problem as defined by the original invention, (b) it is the stage at which the task to be performed is more precisely defined,

the aim more exactly set, the change of final success being more susceptible to measurement than is true at the stage of invention and (c) it is the phase in which commercial considerations can be more systematically examined and the limits of feasibility imposed by the market narrowed down. As one moves from invention to development, the technical considerations give way gradually to economic or market considerations. Thus, there are three sets of concept, viz. (i) science, (ii) invention and (iii) development, the last two forming what is commonly known as technology.

There is close relation between technology and economic growth, between economic and technical change and it is impossible to move or innovate the economy without a conscious use of technology. The inter-relationship between technology and other disciplines could be summed up as follows:

(I) Technology and science are allied disciplines. They are parts of a continuum, albeit each has its distinct role.

(II) Reduction in costs in one form or another is the result of every new technique or

product. Technology is concerned with the development of techniques that culminate in the reduction of costs. Innovation is the offshoot of new techniques.

(III) Technology and economic activity have same or similar aims in a mundane or material society, augmenting satisfaction through innovation arising out of reduction of costs.

Thus, a co-ordinated, well integrated and synchronised approach towards technological development, research and economic growth duly emphasising on the role of import substitution is the need of the hour[3].

Having known what technology means, it would necessary to move a step ahead and know what indigenous technology means.

7.3. Indigenous technology

Indigenous technology can be said to be the one that tries to mobilise and make the fullest possible use of local resources for its application to accelerate the pace of industrialisation. Indigenous technology is also called these days popularly as "relevant technology", "appropriate

technology" or "intermediate technology". As is well known, ours is an agriculturally oriented country, having a large number of villages, spread over throughout its length and breadth. It is here seen that the rural area needs very badly certain technological developments that should go a long way in setting free the people from the fetters and clutches of abject poverty and ignorance. It is, therefore, now-a-days also being largely known as "village technology"[15]. These are different nomenclatures that have been gaining in the currency. The sum and substance of all these is that this technology is none other than that which should be adaptable to the local socio-economic conditions extending the attendant advantages of development of skilled man-power, engineering and technical expertise, research and development capabilities, capabilities for capacity utilisation, for getting over the foreign exchange crisis, for scientific and technological advancements, for generating employment opportunities, for mobilising resources and so on. The terminology "appropriate technology" has a convincing connotation. Whatever has been indigenously developed to suit the market size, capital mobilisation abilities of the entrepreneurs, labour intensivity of

the manufacturing process and end-use characteristics of the final product and so on through an adoptive methods is, really speaking, the appropriate technology. Calling the technology as "indigenous" is not considered desirable, since it is likely to impart an inferior status having inclination towards anything indigenous. And hence these days there is a trend to use different terminologies that would sound better. Afterall, these technologies are supposed to be and should be suitable to the existing socio-economic conditions[13].

Indigenous technology has a crucially important key role to play in the overall progress of developing countries, in particular. These countries are, generally, committed to economic growth which is essentially perceived as the process of increasing material comfort or raising standard of living of the people. It is in this perspective a rapid rate of technological progress that offers the best hope for the underdeveloped areas of the world. It is this technology that has been instrumental in helping a country make spectacular strides in the sphere of industrial growth and development. But it should be noted that the technological progress brings in its

train tensions and imbalances. In fact, in a sense, all innovations are apt to produce tensions. A technology can as well be imported and made adaptable to local conditions, thereby minimising the dependence on import components. In a way, it is tantamount to calling this technology an indigenous one. These tensions and imbalances need to be curtailed so as to achieve the rapid pace of development in various spheres e.g. economic, technical, engineering, design, consultancy and management[12].

Some of the instances that could be cited here, for the sake of quoting them as a passing reference at a glance, are those pertaining to attempts at developing capabilities to harness the solar energy for different uses, India being a tropical country, such as energising pumps for lift irrigation, air-conditioning, etc.; to usher in gobar gas system which again is the source of energy that could be mainly used for cooking purpose; to gear and accelerate the research and development activities for evolving the processes for augmenting production of agricultural inputs like pesticides, weedicides and fertilisers. The attainment of self-reliance through the development and effective, efficient and

expeditious application of indigenous technology becomes all the more necessary, fruitful, meaningful and highly relevant and appropriate in the light of industrial advancement scaling new heights in various agricultural schemes. These two sectors can indeed be aptly said to be two wheels or two bullocks of a cart. It is as such of great significance that this indigenous technology utilisation in a relevant and appropriate manner could be conducive for accelerating the pace of overall development of the national economy, as we have noted earlier, related to not merely industry but all the allied aspects. It is thus well calculated steps that need to be initiated in this direction that would go a long way in using this technology profitably, barring and avoiding the side-effects, if any. For instance, production of pesticides is indeed fraught with numerous health hazards. Therefore, care should be taken to see that the process evolved should be, as far as possible, fool-proof and lacunae or loopholes, if any, should be mitigated or bridged.

Absorption of foreign technology with a future plan to indigenise it could as well be said to be an effort towards the development of relevant

technology. A golden mean, therefore, should be struck between the indigenous technology proper and the technology that is adapted to suit our local conditions, efforts being made to see to it that the element of importation is brought to the minimum, raising the capability to be self-reliant to the maximum extent possible. This is what is, in fact, the crux of the problem. And this is what is anticipated. And this is how it should be. This is how one can stand on one's own dispensing or doing away with the crutches or props. This, as a matter of fact, is what indigenous technology purports to mean in its proper perspective. In the long run developing the potentials for exports to the extent feasible can also be visualised.

It is here and now that it is essential to know of foreign technology in view of the possibilities for absorption of the overseas technology and its further indigenisation.

7.4. Foreign technology

Foreign technology can be broadly said to be that which is imported. It is also called "Alien Technology" or "Overseas Technology". It is this

technology that is supposed to originate from a relatively developed country, in general. This developed country, having developed certain technology, has capabilities that help it to be not merely self-reliant but be able even to extend a helping hand to its brethren in the developing, less developed, under-developed or undeveloped countries. This technology is inherent in the fact that it has the seeds of development. As a result of technological self-reliance, these countries have evolved a built-in mechanism to accelerate the pace of their industrialisation. As we know, technology is inherent in more output with the same input or same output with less input. The capabilities developed in this direction naturally result in efficient and effective utilisation of available resources. The factor endowments are made use of to the maximum extent possible. The developed countries have main thrust on the capital intensive technology, as these countries are supposed to have shortage of labour and surfeit of capital. As such, machinery rather than men have a vital role to play. The developing countries, on the other hand, have scarce capital and surplus labour. Thus, the labour is cheap. The problem that confronts these developed

and developing or less developed or under-developed countries is pertaining to dearth of labour and capital respectively. Thus, the technology of developed countries being labour saving or labour eliminating has got to be made adaptable to the developing and under-developed or less developed countries that desire to utilise that technology. Much as the developed countries would want to help the developing countries, the bottlenecks that come in the way are varied and many - economic, political, social and technical.

It is in this context that the example of Japanese industry needs to be emulated, as we have exhaustively dealt with in Chapter-III, by the developing countries that would give a shot in their arm and boost up their overall national economy. Of course, when the problem of technology utilisation comes up, there emerge different interests - economic, political or otherwise. As we have noted earlier, the import substitution strategy adopted for industrialisation through indiscreet application or imposition of protectionist policy, tariff, export subsidy and all that would dampen the sportive and healthy spirit and adversely affect the international trade/market. The political strings attached to

safeguard the interest of the exporting country at the cost of the importing host country are common phenomena these days. This acts as a deterrent to and hinders the free and unfettered flow of trade. The recent example of attempts at doing away with the Multinational Corporations who offer their free results of research and development efforts to their accessories in host countries, but take away huge sums of money by way of royalty, fees and all that is very much present and is on the anvil to be thrashed to a stage where it should be mutually acceptable and advantageous to both the exporting as well as the importing host countries[16]. The international bodies like United Nations Conference on Trade and Development are noting with grave concern the international developments with respect to trade and industry in the light of rapid advancements that are coming about with the onset of newer and newer technologies all the world over. Further, economists, scientists, technologists, technocrats, bureaucrats, executives, politicians and others alike are preoccupied with the problems created by the technological development. This is crystal clear from the strategy of "collective self-reliance" as advocated by the UNCTAD-V[17]. It is this alien advanced, sophisticated

judiciously implemented technology that is instrumental in making the wheels of economy in general and industry in particular move with phenomenal speed.

As we all know, the nuclear technology is posing a serious problem. That may be used equally effectively either for offensive or defence or peaceful purposes. The potential peril or threat as well as help are both inherent in this technology. As is well known, the recent Strategy for Arms Limitation Treaty (SALT-II) agreements between the two big powers (America and Russia) are the grim reminders of the Damocole's Sword dangling on the head. The matter is of serious concern. At the same time, if used for peaceful and creative purposes, it extends obviously immense benefits resulting in common weal of common man. Political powers, being what they are, are prone and keen to establish their hegemony. As such, the global issue of supplying the products of technology e.g. explosive chemicals and arsenals to warring countries has created tense situation. If discreetly or prudently used, the foreign technology plays a key role, in a way, in helping to improve the indigenous technology or evolve the relevant technology. This aspect needs to be kept in mind.

The international trade brings in its fold countries nearer and closer. In order to make progress, the process of imports and exports assumes preponderating significance. Imports as well as exports of goods and services emanate. Technology is not an exception. The technology needs to be carefully assessed before it is transferred for commercial utilisation or exploitation.

7.5. Technology assessment

Anything that is available is not acceptable unless it is thoroughly assessed or appraised about its effectivity and utility. Therefore, albeit a technology is at the stage of being transferred, nevertheless it needs to be critically examined from various angles. It is in this context that the "technology assessment" assumes an over-riding importance. It is, therefore, incumbent on us to evaluate or examine the technology before it is transferred and translated into action or put into commission. Broadly, technology assessment is an attempt at examining the social, political and physical consequences of the application of a present or emerging technology. It can be defined as a systematic analysis, where all impacts and implications, direct or

indirect, real or potential, present as well as future, beneficial or detrimental of a technology, are defined, evaluated and measured and the cause-effect relationships identified. The results of a technology assessment must incorporate alternative solutions to a problem, ranked according to their social cost-benefits. It is felt necessary and desirable to know beforehand the effects of technology. In other words, it means having an "early warning" system to see to it that the technological development is so directed as to maximise the public benefits and minimise the public risks. Obviously, out of this reasoning there came into being the process we now call "technology assessment", this term having been coined in 1969 by Philip B. Yaeger, Counsel for the Committee on Science and Astronautics, U.S. House of Representatives. Technology assessments, it would be seen, could be used as a guideline for making a decision by the policy maker. This would as well go a long way in helping the entrepreneur as to whether he should accept the know-how arising out of the technology at all.

Classification of technology assessment could be indicated in a tabular form as follows:[1]

1. Future oriented

   1.1. Anticipatory - Forecasting new trends and their possible effects: cryogenics, central data banks, genetic engineering.

   1.2. Responsive - To already received problems: new dams, trams, Alaska pipeline, nuclear power plants, new jet ports.

   1.3. Reactive - To problems with unknown causes or disasters: power failures, earthquakes, oil spills, midair collisions.

2. Present time oriented

   2.1. Corrective - Known problems, effects are felt, causes traced, corrective action feasible: pollution, rural poverty, traffic congestion.

3. Past time oriented

3.1. Retrospective - Examination of circumstances and facts: why was a project successful, rejected or abandoned. Nuclear plane.

The above classification would certainly lead to the process of making proper decisions as to the viability and feasibility of a technology with a view to having it effectively transferred and translated into reality. Its transferrability for commissioning would attract the entrepreneurs at utilising the technology that they desire to adopt. The past, present and future trend of a technology helps him take the right decision for establishing his own concern for commercial use of the technology. This process gives a clearcut picture as regards the potential use of a technology. It is this assessment that would give a green signal for the utility of a successful technology. It may also sound, alternatively, an alarm for a doubtful technology. Based on this, as indicated earlier, it could be decided as to whether a particular technology could be transferrable to an entrepreneur or not. It would help an entrepreneur either to accept or reject a technology. Thus, a decision making process could be

set in motion at both the ends - the transferring and receiving. In the light of this it is appropriate to see the foreign technology and other collaboration aspects.

7.6. Foreign collaboration

If we are not producing anything, then naturally we have to import. Or alternatively, despite the local manufacture, the quantity so produced may not be adequate to meet the domestic or internal demand. In order to bridge the gap between demand and supply we have to import. Or the quality of the indigenously produced goods may not be up to the mark. Albeit quantitatively and qualitatively the product may be approved, nevertheless if the cost of production is exorbitant, importation is the solution. Thus, quantity, quality and cost factors are of paramount significance in any process. On this analogy, it could be stated, the need for entering into foreign collaboration agreements would emerge. It is with this end in view that this device is adopted. However, this makes inroad in our economic system in the long run adversely affecting it. It is, therefore, seen that the collaboration with foreign countries is made with certain amount of reluctance and rigidity taking

care to see that the collaboration does not supplant the economy. It is meticulously seen that this should help supplementing and thus bridging the gap arising out of the above factors that come in the way of smooth and efficient performance of the economy as a whole.

In view of the fact that the possibility of foreign collaboration through multinational corporations ruthlessly exploiting the host country cannot be ruled out altogether despite various rigid conditional clauses, as far as possible this device for economic development is cautiously adopted. Generally, thus, there is emphasis on discrimination in the import of technology. In spite of the fact that such a regulation is enforced, there has been no substantial decline in the demand for foreign collaboration. It is reported, for example, that in 1975, 471 applications for foreign collaboration were received by the Government of India, out of which 244 were approved including 158 collaborations in electrical equipment, industrial machinery, chemicals and transportation and 81 were rejected. This is indicative of technological gap that existed then in India. However, it should be seen whether the importation of foreign technology is of indispensable nature. There is a pressure of export

market that calls for quality goods. It should be remembered that India has a strong point in so far as it has an intermediate technology backed by cheap skilled labour. Just because a technology is not available in the country, it should not be imported. It is not unlikely that the technology (and its products) of a developed country may suit us. But this might choke domestic development of relevant technology. The very viability in industries hinges on rapid diversification. This process may be retarded if there is indiscriminate technology import.

In recent years, there is a phenomenal rise in demand and craze for more and more foreign collaboration apparently because deficiencies persist despite the continuous import of technology (e.g. 4000 collaborations were approved from 1948 to 1976). Regrettably, there is an element of repetition in much of the import. Further, there is hardly any improvement in quality of successive imports. Multiple collaboration agreements have come to the fore because of the fact that in a protected domestic market they wish to gain an edge over the rival producers. As a sequel, the pool of technology is far from enriched by the vast import. Besides, in collaboration ventures the absorption of

technology is not up to the mark, rendering transfer difficult, in view of the prevailing mental attitude of the entrepreneurs. Indigenous technology is considered either unproven or obsolescent. The latest imported technology is, therefore, given precedence. The suppliers of this technology, albeit it is generally not up-to-date, for commercial reasons are not much bothered to ascertain that it gets rooted itself in the importing country. There is tremendous scope for substitution of imported technology by indigenous technology. This is quite revealing, in that 300 claims had been made (as up to 1976) before the Data Bank of Directorate General of Technical Development (DGTD). Ten out of them had been accepted for horizontal transfer. For obvious reasons, its pace cannot be forced.

In fact, the key issue is effective, efficient and expeditious absorption of imported technology. In turn, that would certainly go a long way in enriching the indigenous technology. The pace of absorption could be quickened by way of exchange of expertise between the private sector as well as agencies like DGTD, Council of Scientific and Industrial Research (CSIR), the Department of Science and Technology (DST) and public sector enterprises. This would further

promote the inter-disciplinary approach that is essential and conducive for the growth of industrial technology[14].

It is to be seen as to what would be the quantum of foreign exchange outge in this event of having effected a foreign collaboration agreement. It would cost the country's foreign exchange in the following ways:

(a) for the project report,

(b) for the know-how,

(c) the collaborator's percentage share in profits,

(d) royalty for patents,

(e) purchase of components and equipments for specific purpose from a specified country where the prices may be marked up compared to other parts of the world.

For having effective import substitution the following should be done:

(1) All-out efforts are warranted to see to it that after a short period, domestic production and management substitute imports of both materials and

know-how.

(2) Adequate export sectors should be created with a view to overcoming numerous problems arising out of competitiveness.

(3) The problem of maintenance and developmental imports could be got over provided sufficient plans for such a problem are chalked out to:

(a) step up the domestic production of raw materials,

(b) substitute domestically available materials for those imported and for which the country does not have much natural endowments,

(c) manufacture of components and spares within the country.

All the above are within our capacity if well integrated and co-ordinated action is initiated, thus achieving substantial savings in our maintenance imports in a reasonable time. Foreign collaboration, it needs no reiteration, if properly implemented, would immensely help in quickening the pace of attaining self-reliance[10].

Foreign collaboration is permitted by the Government of India in the fields of high priority and in areas where the import of foreign technology is considered on merits and if substantial exports are guaranteed by the prospective collaborating firm. Normally, the collaboration agreements are accorded approval for a period of five years or a maximum of eight years from the date of signing of such an agreement. The Secretariat for Industrial Approvals, Department of Industrial Development, Udyog Bhavan, New Delhi-1, deals with foreign collaboration agreements. Assistance and information pertaining to foreign collaboration is extended by the Indian Investment Centre, Jivan Vihar, Parliament Street, New Delhi-1. The total number of collaborations as approved by Government of India is more than 4000, comprising joint ventures, financial collaboration, financial-cum-technical collaboration and technical collaboration. The eight main countries and their respective number of collaborations with Indian counterparts are as under: UK - 998, USA - 760, Federal Republic of Germany - 656, Japan - 400, Switzerland - 200, France - 172, Italy - 176, German Democratic Republic - 89[8].

Technical collaboration agreements can be said to

be effective only when the technology transfer ensues and it is translated into action. In fact, technology transfer can as well be effected even within the country itself. It is, hence, all the more essential and desirable to look into the process or norms of technology transfer.

7.7. Technology transfer

One of the fascinating phenomena of the post-world war II period has been the burgeoning or proliferating growth of the science and technology activities. Yet within the past few years both participants in and observers of these activities have prominently shifted their concern from the focus on the process of creating new scientific and technological advances towards a greater emphasis on the effective utilisation of the discoveries and developments. Technology transfer is defined by a set of four categories: (1) "direct transfer" - the transfer technology was the essential technical base on which the new company was built, (2) "partial transfer" - technologies from other places also contributed to the technical strength of the newly formed organisation, (3) "vague transfer" - this designates those situations in which same technology transfer occurred, but the transfer was of general

skills rather than of specific ideas or devices and (4) there are some companies which reflect no technology transfer. In this process no technical knowledge stemming from the source organisation could be identified as transferred into the new company[11].

The dissemination and transfer of knowledge about scientific and technological discoveries has been a matter of great significance right from the inception of the organised efforts in science and technology in the early part of this century. The dissemination techniques are conventional. These are effected through the scientific papers, scientific meetings and person-to-person communication. Similarly, the transfer of knowledge connected with developments in technology is not a new issue. The general process of applying new technology - process proceeding from basic research through to initial applications - is well understood and widely employed[2].

The efforts for development of technology are specially made with a view to attain advancement. The development of technology is inherent, in its turn, in the development of industrial research. The pre-requisites for the success of industrial research may be enumerated as given below:

(1) Availability of trained laboratory researchers, engineers, technologists, technocrats/ managers.

(2) Liaison between governmental and university research and development institutions, industry and governmental planning and policy making bodies.

(3) A national science and technology policy for promotion of industrial research; setting up of priorities for financial inputs in relation to national needs as regards areas of industrial research; respective areas for research and development activity in industry, co-operative research associations and government research institutes; role of governmental priorities for research and development inputs.

(4) Incentives for indigenous research and development and/or induction of technology trained entrepreneurs.

(5) Availability of project engineering and design organisations and plant fabrication capacity, as also incentives for promotion of these facilities.

Despite the prevalence of the above pre-requisites and proper circumstances for industrial

research, it is of utmost necessity to see to it that such a research forms a total system arising out of the entire innovation, technology development and technology transfer chain. In order to have successful industrial research and transfer the resultant technology arising therefrom, applied research is required to be carried out. This applied research with regard to chemical industry could be effectively made by adopting the following five principal principles:

(I) Identification of industrial problems and selection of particular problems from amongst many for research and development investment.

(II) Search for various alternative solutions for the selected problem and the techno-economic choice of a particular solution or a few alternative solutions for detailed investigations.

(III) Detailed planning and evolution of a strategy for an integrated research and development effort, to try out the chosen solution/s in the laboratory and pilot plant and fixing the time targets.

(IV) Execution of laboratory and pilot plant work within the prescribed time target and continued critical evaluation of results from the techno-economic viewpoint.

(V) If the technology developed ensures economic gains, the initiation of actions for transfer of such technology to industry and eventual adoption of the developed process/product on a commercial scale by industry.

The above is a chain of steps which should move in succession to achieve the desired results of technology transfer.

The first step with respect to identification of industrial projects and assignment of priorities is required to take into account the process of research and development for which the following points need to be considered.

(1) Is it a problem which needs solution and is worth investing research and development funds? If yes, then the precise definition of the problem in techno-economic terms be made. Arrangement of the problems in order of priority depending on economic size (value of production per annum, of saving per

year expected to be had by adaptation of technology to be developed) becomes necessary.

(2) Extent of urgency in finding a solution.

(3) Identification of prospective users of technology to be developed and estimation of the extent of their real interest to commit funds for adaptation of technology tc be developed.

(4) Estimation of the obsolescence of the technology to be developed.

(5) Estimation of the price at which the goods manufactured by the technology developed could be marketed in regard to ruling domestic and import price.

(6) If there is already an installed capacity for industrial products to be manufactured by the technology to be developed, then the justification of fresh research and development effort on such problems.

(7) Estimation of cost of completing the project including pilot plant and design development work and the cost of commercialisation of the new process/technique.

(8) Technical feasibility of the project.

(9) Can the project be better carried out elsewhere?

The above points are quite clear as to research and development efforts.

It is seen that cost-consciousness and accountability factors are not appreciated by scientists and research managers, however. Entrepreneurs play a key role in minimising the technology transfer problems. It is necessary to transfer the technology by including the industry in decision making process. Further, government departments (DGTD). Planning Commission and concerned ministries could give a proper picture and shape to technological needs. Besides, the Science and Technology Plan (STP) evolved by the National Committee on Science and Technology (NCST) would be the best source for research projects of socio-economic relevance.

The second step is related to selection of particular solution/solutions of the identified problems out of the various possible alternatives based on techno-economic merits, level of technological

expertise available, estimated capital investment needed, indigenous availability of raw material, equipment and so on. In this case the solution/s should be optimum rather than the best one. Yield of product, technical efficiency, prices, toxicity and effluent problems such as pollution need to be considered. Value analysis could be made to reduce the cost. So also sensitivity analysis with different assumptions on costs, prices, efficiencies of the process steps, could feed back valuable information to the researcher. This would indicate the potential of the project. The techno-economic considerations as existing in India should form the basis for making a choice of a particular solution for detailed research and development.

The third step is in relation to planning of laboratory and pilot plant work, fixing the time target. In this case, after having had a solution for studying a particular problem, it is necessary to decide scale of experimentation, organise a PERT (Programme Evaluation Review Technique) Programme for execution of work within the prescribed time target, line up administrative, engineering and design support and select best suited personnel. This will

be a well integrated, co-ordinated and synchronised approach in planning and execution which will go a long way to complete the work within the targetted time schedule.

The fourth step pertains to execution of research and development work and evaluation. Evolution of optimum process conditions in the shortest possible time is of vital importance. Break even point would give correct understanding of the projection and expectation of profit. Thus, an idea for commercialisation of the process could be had. The techno-economic evaluation of the technology developed should be attractive enough to offer gains. Orelse it is better to drop such a project in the long term interest of research establishment as well as the entrepreneur.

The fifth and final step is of crucial importance in that it is directly associated with transfer of laboratory/pilot plant research/development to industry. The influence of an enlightened forward looking and practical research management on the transfer of technology has to be taken into account. Further, requisite liaison and co-ordination between different links of the transfer chain consisting of

research, development, application, engineering, production and marketing is all the more necessary for efficient and effective technology transfer.

7.7.1. Vertical and horizontal transfer of technology

Having gone through the five corner stones of industrial research and technology transfer chiefly pertaining to chemical industry, it is warranted that the kinds of technology transfer be studied. They comprise vertical and horizontal transfer of technology. The vertical transfer is much easier being in the same institution or industry, whereas horizontal one is rather complex taking place from one industry or research and development laboratory to another units which are administratively independent. The latter may either be international or indigenous. In India 92-94% of research and development inputs are by government and the remaining 6-8% is spent by industry.

The problems of horizontal transfer of technology especially from government agencies such as Council of Scientific and Industrial Research and so on assume vital importance. It is necessary to

find out the factors that affect horizontal transfer of technology from government and private research and development organisations to industry. They may be enumerated as follows:

(1) Scale and level of development related to the production unit to be set up and the needs of entrepreneur.

(2) Capital investment envisaged for full scale production unit.

(3) Guarantees of performance.

(4) Association of project engineering firms for offer of turn-key plants.

(5) Collaboration of industry/National Research Development Corporation (NRDC) for setting up semi-commercial proving plants and providing developmental risk capital.

(6) Mental attitudes and innovation quotient (IQ) of the receiving organisation.

Scores of factors such as resistance to change, lack of capital, adverse trade union movements, monopolistic practices, artificial cost price structure,

lack of faith in indigenous technology and dearth of enough scientific and technological base are the impediments hindering the smooth process of technology transfer. It is, therefore, of utmost importance that the government plays a key role in making determined endeavours to promote technology transfer.

As regards factors affecting vertical transfer of technology within an organisation, they may be:

(1) incompetent communication,

(2) management reluctance to take risks,

(3) occasional conservatism,

(4) disinclination of the scientists to work in factories,

(5) incompleteness of scientific and economic data,

and (6) geographical separation of research from production units.

As against these adverse factors, the complementary and conducive factors could be:

(a) clear definition of objective,

(b) acceptance of these objectives by the top management,

(c) communication of these objectives throughout the research, development, production and marketing organisation,

(d) establishment of contact at different levels (multiple level contacts),

and (e) general education at all levels on the value of transfer of technology to the total well being and profitability of the organisation.

In the process of effecting international transfer of technology, the association of research and development organisations of an importing country should study the quality and price of the technology to be imported and the amount as well as the necessity of imported equipment. With the active assistance of such an association it may be easier to design future plants with indigenous effort by scaling down of existing processes and possibly with improved features.

The role of project engineers in extending guarantees of performance in almost all the cases of

horizontal transfer is not less significant. Doubtless, the users of technology, too, should have the proper mental approach to indigenous inhouse research. Thus the capabilities and mental attitudes of the licencee are of great importance for successful technology transfer. This healthy attitude would go a long way in having effective communication between the two groups. General education of potential users is also necessary. Through demonstration and publicity of success stories a change in mental attitudes and improvement of innovation quotient of users of research or technology could be brought about. It is further necessary that there exists efficient liaison, co-operation and co-ordination among various links in the transfer chain comprising research, development, engineering, production and marketing.

Interestingly, there had been significant step up in the pace of industrial production based on indigenous know-how (developed by the National Chemical Laboratory, Pune-411 008). Following figures, though terminating in the year 1971-72, as a passing reference, would reveal this trend[18].

	1968-69	1969-70	1970-71	1971-72
Number of processes in production/ value in rupees million	47/70	53/13.00	55/28.14	51/47.10

Technological advances carry with them the very threat of destruction of human beings and cherished human values. A new technology might bring in its wake intrinsic hazards. The shrinkage of the time interval between the origins of a technology and the time its social effects are felt means that the practice of technology with intrinsic hazards will result in more injury to more people at an earlier point of time. The growth of radiation-producing technology is a good example of hazardous technology. The radiation example is only one of a number which can be cited. The development of sonic boom-producing aircraft, weather modification, computers, electronics and biological and genetic engineering technologies all raise, in some form or other, much the same problem. The social cost of the technology needs to be taken into account[7].

To just cite a recent instance, it was at 2141 hours on Wednesday the 11th July 1979 that the

US Skylab, a ghost ship with a proud tradition, plummeted back to earth like a flaming meteor. The satellite dumped its tonnes of molten debris into the Indian Ocean south west of Australia. People all the world over were sitting with their fingers crossed that they may fall victim any moment! However, it was reported, there were no damages to life and property anywhere[4]. Doubtless, the data gathered by the Skylab of the earth and its environment provide valuable information which should help improve food production, both quantitatively and qualitatively. Equally, the project has enabled scientists to have a closer and deeper understanding of the sun. This will help them evolve ways and means to utilise solar energy for human good[5].

However, the economic growth of a country can be enhanced appreciably with more effective use of the technology. Not merely would economic growth be accelerated, but many social and community problems could be understood better. Technology transfer fosters more widespread distribution of industrial and commercial activity among the various regions in the country.

The above detailed discussion over the

technology transfer throws abundant light on its important role in utilising the indigenous technology. Besides, it gives an indepth outlook as to how healthy mental attitude would be instrumental in being equally receptive to indigenous as well as foreign imported technology. It is necessary that old outdated and obsolete attitudes, approaches and policies be abandoned in favour of pragmatism, efficiency and discipline. It is only in these terms that the country can achieve strength and viability. Further, the import components could be brought to the minimum by improvisation and effecting transformations in the imported technology itself, thus ultimately leading to conversion of the overseas to the relevant technology. Thus, the problem of transfer of technology assumes added significance in the shrinking world flooded with highly sophisticated technologies in the face of stiff competition.

Having had an exhaustive outline with regard to "technology", "indigenous technology", "foreign technology", "technology assessment", "foreign collaboration" and last but not the least "technology transfer" a modest attempt at studying the potentials for import substitution is called for with a view to

assess the impact of import substitution strategy on the overall development of national economy.

7.8. Potentials for import substitution

As has been aptly observed in the beginning of the chapter, import substitution strategy has an over-riding sway or drift towards and extremely close association with the development of technology indigenously and its effective use in order to be self-reliant and independent of foreign help and aid to the maximum extent possible. It is in this connection that an attempt has been made to study the potentials for import substitution in the light of the awards announced and given away by the Government of India to the meritorious contributions made by our entrepreneurs culminating in import substitution. As such, there has been an immense drive made by the Government to encourage the development of indigenous technology. With the result of particular efforts made by the then Prime Minister Late Pandit Nehru a chain of research and development laboratories and/or institutes have been established. Thus, both intensive as well as extensive endeavours made by these laboratories have borne and are bearing fruit. There are proven indigenous technologies

available which are of similar or same grade vis-a-vis their alien counterparts in terms of quality, quantity and cost. The competence of these institutes is beyond an iota of doubt. The research personnel are also of comparable calibre as against those abroad. Their attempts at mobilisation and exploitation of local or domestic resources are laudable. This is clear from the awards, as indicated above, to the concerns, which develop indigenous products or processes, by the Government of India under the aegis of the Ministry of Industry twice a year. This bears an eloquent testimony to the fact that the Government have been earnestly endeavouring to encourage the development of indigenous technology. This has naturally given a big initial boost to the Indian entrepreneurs to mobilise and exploit the locally available domestic resources at their end.

The national awards were announced for meritorious import substitution on the Republic Day 1977 and Independence Day 1977 and presented by the then Hon. Minister of Industry, Mr. George Fernandes, on September 24, 1977. A Board of Awards for Import Substitution has been constituted under the Ministry

of Industry. This Board focuses increased public attention on the need for maximising import substitution - a scheme for timely and proper public recognition to individuals and institutions on the worthwhile import substitution. Under the scheme the Board under the Ministry of Industry was reconstituted in June 1974. The Awards are announced twice a year viz. on the eve of the Independence Day and Republic Day. The Board is assisted by two Evaluation Committees - one for Chemical Industries and the other for Engineering Industries. These Committees are composed of eminent scientists and technocrats in the field. In the following paras is given an information as to the awardees and the details regarding the import substitutes effected by them as well as the foreign exchange saving resulting therefrom. These data[6] will amply throw abundant light on the advancement made in this direction by our entrepreneurs, thereby averting a drain on foreign exchange to that extent (see table-1) and thus helping circulate the money within our own economic system.

(1) M/s Sarabhai M. Chemicals, Gujarat, were awarded a Bronze Shield for the development of

Mannitol which is used in pharmaceutical, electrical, food and chemical industries. It is progressively becoming a versatile tableting base for "melt-in-your-mouth" chewable tablets such as vitamins, antacids, aspirin and steroids. It is administered intravenously in the form of sterile aqueous solution. It is useful as osmotic diuretic in the treatment of kidney failure, glaucoma, oedoma and brain surgery. It is also used as an excipient for drugs and vitamins such as vitamin B_{12} organic nitrate vasedilators. Foreign exchange conservation during 1976-77 was nearly Rs.15/- lakhs.

(2) M/s Sandeern Chemical Co., Maharashtra, were awarded a Bronze Shield for developing Ethylene Urea. It is an important textile finishing agent, a preparation of dimethylol ethylene urea. It is used in explosive manufacture, as a chemical blowing agent and antioxidant. It is also used as a corrosion inhibitor. Foreign exchange saved during 1976-77 was to the tune of Rs.7/- lakhs.

(3) M/s Cadila Chemicals Pvt. Ltd., Gujarat were awarded a Bronze Shield for the development

of Glibenclamide. It is an antidiabetic drug. The firm has developed this from the very initial stage. The drug has a maximum dypoglycaemic effect in an oral dose for treatment of maturity-onset diabetes mellitus. Cadila Glibenclamide conforms to international standards laid down under the British Pharmacopoeia. The foreign exchange saving during 1976-77 amounted to about Rs.3/- lakhs.

(4) M/s Injecto Pvt. Ltd., Harayana, were awarded a Bronze Shield for the development of 50 cc carburettors. It is useful for maintaining a constant petrol level in float chamber even on hilly roads. Foreign exchange saving during 1976-77 was around Rs.10/- lakhs.

(5) M/s Electronics Corpn. of India Ltd., Andhra Pradesh, were awarded a Gold Shield for the development of electronic components, viz., solid tantalum capacitors, high stability carbon film resistors and 10-turn precision wire-wound potentiometers. These are used in equipments for defence, space and medical, which are based entirely on indigenous know-how. The firm has developed capabilities for indigenous productionisation of the sophisticated electronic items to meet the stringent

specifications. There was a recurring foreign exchange saving to the tune of about Rs.90/- lakhs during 1976-77.

(6) M/s Press Metal Corpn. Pvt. Ltd., Maharashtra, were awarded a Silver Shield for the development of side frame members of Leyland trucks and longitudinal members of Shaktiman vehicles. The foreign exchange saved during 1976-77 was little over Rs.80/- lakhs.

(7) M/s Texprint Engineers, Gujarat, received a Silver Shield for the development of flat-bed screen printing machine resulting in the saving of foreign exchange to the extent of Rs.65/- lakhs during 1976-77.

(8) M/s Arim Metal Industries Ltd., West Bengal, were also awarded a Silver Shield for the development of nickel and nickel alloy rods and anodes. The entire metallurgical technology has been developed from grassroots, the foreign exchange saving therefrom amounting to Rs.54/- lakhs during 1976-77.

(9) M/s Footwear Equipment, West Bengal, had been given a Bronze Shield for the development of injection moulds of PVC footwear. These moulds are specially adaptable by small and medium footwear manufacturing units for economic production of footwear. Foreign exchange conserved during 1976-77 was a little over Rs.8/- lakhs.

The study is restricted for the quaternary period between 1973-74 and 1976-77, in this chapter the terminating year 1976-77 having been taken up for consideration. In the light of this, an humble attempt has been made to assess the impact of import substitution and evaluate the pace of industrialisation. It would, thus, be seen from the table-1 that there has been a significant sway seen in our entrepreneurs engaged in various branches of industry to make determined efforts to mobilise and exploit the locally or domestically available resources. They have come to the light owing to the awards announced and given away to the import substituting entrepreneurs. The saving generated in foreign exchange (in this case Rs.332 lakhs during the year 1976-77) is modest enough to encourage our own entrepreneurs, thereby justifying the import

substitution strategy for overall development of the national economy. These examples cited would be good enough to prove the significance of this strategy. As has been observed, there are various ways to measure the content and meaning as well as impact of import substitution and hence the publicity for each one of the aspects involving import substitution is a formidable task, though not impossible. However, it is noted with gratification that the trend to depend heavily on the process of self-reliance has been gaining in magnificient momentum.

Comparatively, our own indigenous products are as good as, if not better than, the foreign goods. Quality-wise, quantity-wise and also cost-wise they are quite in conformity with their imported counterparts. There is also a significant improvement in our indigenous technology. The absorption of the overseas technology to make it relevant or appropriate is also quite up to the mark. Besides, government has also come forward to lift our entrepreneurs up and enhance our production and productivity. Thus, the government has been persistently and consistently striving for a vibrant as well as self-sustaining industrial economy by adopting the import substitution

strategy. This has resulted in the overall growth and development of the national economy. More importantly, the attitude of consumers or customers is also undergoing rudimentary transformation and a seachange slowly but steadily and they are becoming receptive to and appreciative of our own goods rahter than blindly running after the foreign goods. So have the entrepreneurs been doing to accept the indigenous know-how and making spectacular strides. It is not that they are shielded every time from the foreign competition by way of variegated protections given by the government, but they have developed their own capabilities in all respects to stand squarely on their own and stand the test of the time. They have all the requisite parphernelia - scientific, technical, managerial and administrative - and other relevant infrastructure.

Not merely the individual establishments are making copious progress, but a virtuous circle is set in motion, thereby all the other attendant, allied and associated industries are extending their helping hand. This has, of course, culminated in the maximum amount of self-reliance. Thus, the ordinary foot-path vendors on the one side and the

highly modernised merchants on the other do make their contribution to advance the rate of import substitution strategy and help it propel with phenomenal speed. The highly sophisticated gigantic equipment and machinery on the one hand as well as tiny precision gadgets, instruments and devices on the other are being manufactured indigenously not only to meet effectively the domestic demand, but there being bright chances for exporting them to other countries, the same are being exploited earning the valuable foreign exchange. So also the goods produced and services rendered are quite comparable to their foreign counterparts of international standard. The technological know-hows have also reached a stage where their credibility in the international market is beyond any shadow of doubt. In other words, the indigenous technological inventions do meet effectively the standards, norms or stringent specifications pertaining to technical feasibility, economic viability and commercial attractiveness as well as inherent growth potentials for their timely and adequate exploitation or implementation.

(1) Technical feasibility - The technology should be technically feasible and sound enough in the

sense that it should be possible to translate it into action or reality. It should have no technical flaws, thus being free from any technical problems or implications that would otherwise make the process unwieldy. Quality of the product coming out of this process should be up to the mark and comparable to its international counterpart.

(2) Economic viability - The process should not be uneconomic. From this angle it should be viable, lest it is excessively costly and unremunerative. Obviously, no entrepreneur would come forward to take up such a technological process. Quantitatively, the product should be available adequately as well as economically.

(3) Commercial attractiveness - There should be sufficient demand for not merely technology but even to the products that are manufactured with the help of this technical know-how. Thus, the process should be adequately attractive and worth undertaking for commercial exploitation or implementation.

(4) Growth potential - There should be the requisite growth potential, in that the technology must be sound enough to sturdily stand against stiff

competition. As such, the competence of the technology and products emanating therefrom should be taken serious note of.

As the study and development are a continuous process, here an humble endeavour has been made at carrying out studies to critically evaluate the impact of the import substitution strategy on the accelerated pace of development of industry and attention focused on its salient features. The study is confined to a quaternary period, as indicated earlier, and a few instances that have been quoted in this study go a long way to emphasise the significance of the import substitution strategy and its potentials, leading to the accomplishment of self-reliance and self-sufficiency that have been immensely contributing to the overall development of the national economy. Thus, the picture that emerges out as to the import substitution strategy is all-pervasive embracing different aspects of the overall economic system.

Table-1

Import substitution and foreign exchange saving

Sr. No.	Firm(s)/award(s)	Product/process developed	Foreign exchange saving during 1976-1977 (Rs. in lakhs)
(1)	(2)	(3)	(4)
1.	M/s Sarabhai M. Chemicals, Gujarat/Bronze Shield	Mannitol	15.00
2.	M/s Sandeern Chemicals Co., Maharashtra/ Bronze Shield	Ethylene Urea	7.00
3.	M/s Cadila Chemicals Pvt. Ltd., Gujarat/ Bronze Shield	Glibenclamide	3.00
4.	M/s Injecto Pvt. Ltd., Haryana/ Bronze Shield	50 cc Carburettors	10.00
5.	M/s Electronics Corpn. of India Ltd., Andhra Pradesh/Gold Shield	Electronic components, e.g. solid tantalum capacitors, high stability carbon film resistors & 10-turn precision wire-wound potentiometers.	90.00
			125.00

Table-1 (Contd.)

(1)	(2)	(3)
	...	125.00
6. M/s Press Metal Corpn. Pvt. Ltd., Maharashtra/Silver Shield	Side frame members of Leyland trucks and longitudinal members of Shaktiman vehicles	80.00
7. M/s Texprint Engineers, Gujarat/Silver Shield	Flat-bed screen printing machine	65.00
8. M/s Arim Metal Industries Ltd., West Bengal/ Bronze Shield	Nickel and nickel alloy rods and anodes	54.00
9. M/s Footwear Equipment, West Bengal/ Bronze Shield	Injection moulds of PVC footwear	8.00
Total	..	332.00

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VIII-CHAPTER

FINDINGS AND SUGGESTIONS

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FINDINGS AND SUGGESTIONS

8.1. Preamble

An humble attempt has been made here to epitomise the study incorporating conclusions drawn and suggestions made with respect to efficacy, adequacy and relevance of the import substitution strategy as applied to the Indian socio-economic, techno-economic, and allied conditions prevalent as at present in particular in relation to the identical conditions in vogue all over the world in general.

8.2. Moving spirit of import substitution

Soaring domestic market with economic development and impediments in routine international trading relationships on account of war and balance of payment crisis gave birth to import substitution. Besides being an economic issue, it has a technical orientation, too, inherent in technological advancements through the development of appropriate technology resulting in acceleration of indigenous production and productivity. Furthermore, it has also an emotional tinge stemming from the elements of

self-reliance and self-sufficiency. Broadly, import substitution, involving the development of domestic industry through varying forms of protection, is pervasive element of economic policy in today's less developed countries.

The application of import substitution strategy for the acceleration of industrial development, particularly that of chemical industry, needs no special stress. The technological obsolescence of chemical industry warrants adoption, adaptation and timely absorption of technology. This goes a long way in achieving self-reliance and rapid rise in production and productivity. It is in this context that the indigenous technology plays a crucial role in the growth and development of chemical industry. Chemical industry covers, as is well known, a large number of heterogeneous but closely interconnected group of industries. As such, the study of chemical industry in the light of import substitution becomes all the more interesting, enlightening, informative and hence imperative. It is, therefore, with this end in view that the strategy of import substitution has been studied, and further continuous study is needed.

The government's inclination to support import substitution also calls for special attention to study its aspects. The scope of this study is quite considerable, in that the attendant advantages of development of skilled man-power, engineering and technical expertise, research and development capabilities, capabilities for capacity utilisation, for tiding over the foreign exchange crisis, for scientific and technological advancements, for generating employment opportunities and for mobilising resources could be reaped. Thus, the purpose of the study is obvious. In this it is inherent to look into the aspect of import substitution strategy or policy pertaining to its relevance, efficacy and application for attaining overall development of the national economy. Significance of the study needs no special emphasis. In fact, import substitution is a total, a macro and more than a national approach. It is a policy making approach and will be immensely useful to any developing economy. So lessons drawn from the strategies adopted in India will be of great use to similar other countries in the world.

8.3. Annals of import substitution

It would be noticed that it was during the wars that the communication problems raised their ugly heads. This obstructed free flow of the goods and services in the international markets. As a corollary, there was an element of compulsion to make use of the available resources to manufacture those goods that were required to be imported, otherwise.

As for India, the condition even before the Great Wars was precarious. The Colonial Rule of the Britishers had shackled the economic activity. As such, there was no economic independence. The Great Wars and prior to that the colonial reign were instrumental in creating an urge and impulse in the minds of Indians to resort to "Swadeshi Movement". This culminated in political freedom and economic emancipation. After the attainment of independence in 1947, there has been a consistent and persistent approach on the part of the government to see to it that, as far as practicable, the self-reliance and self-sufficiency should be adhered to. The industrial policy framed

had and still has a sway tilting the balance towards import substitution.

8.4. Contemporary industrial scene

It is seen that in India including Japan, China, Gulf and other countries, there has been a stress from the inception of the process of an industrial development on the achievement of self-reliance. It is further seen that war was the principal calamity that crippled and adversely affected the normal conditions conducive for promoting international trade. Besides, other attendant constraints such as colonial rule and balance of payment crisis gave big push to embrace the strategy of import substitution. In this general condition the industrial scene was more or less uniform and ubiquitous that led to fostering the import substitution strategy.

It would be observed that the Japanese made significant strides in their indigenous technology right in the very teeth of multifarious problems. Now they are on the pinnacle or zenith of the international market. It is a tiny country. As against this country, just the overwhelmingly

populated comparatively large country, China, by adopting labour intensive technologies, has been making rapid strides and copious progress, much to the astonishment of the entire world!

As regards the Gulf countries, they have bonanza of oil. The entire global economy is almost in their hands, oil being the principal source of energy. However, the oil is a natural resource subject to depletion in due course of time. As such, these countries are frantically trying to set up non-oil industries. Their anguish, anxiety and apprehension are quite obvious. Thus, the industrial scene that gives us a picture of growth and development of industries is self-reliance oriented.

Interestingly, even the developed countries are busy now in having reliance laid on dispensing with the oil and endeavouring to have some substitutes like solar energy, nuclear energy and atomic energy. Thus when compared to India, the situation almost all the world over is nearly identical. There is, therefore, more bent towards import substitution.

8.5. Chemical industry in relation to import substitution

It would be noted that the chemical industry struck its deep roots in the Indian economic system in the early twentieth century. The late Acharya P.C. Ray and others set up the unit of Bengal Chemical and Pharmaceutical Works Ltd. in the outskirts of Calcutta in 1901. This is a htetrogeneous industry. It embraces a wide range and variety of industries from the giant petrochemical and fertiliser complexes to the smaller and light industries as the paints and varnishes and is closely linked with other industries on the broad industrial spectrum of the nation. It is a technology intensive and knowledge oriented industry. The rate of technological obsolescence is very high in this industry. Being technological intensive, it has immense potential for fruitful and meaningful application of indigenous, appropriate, intermediate or relevant technology. Significantly enough, it occupies the fourth position after iron and steel, engineering and textile industries.

It has now come to occupy the tenth position in the world. There can be no limit to the development of chemical industry. The present age can be aptly called the "chemical age" as it has made not only substantial strides in its own field but has successfully made an entry into the fields like glass panes, tableware and numerous fancy articles which were formerly made only out of porcelain or glass.

In the early stage of development, the Indian chemical industry largely depended upon foreign collaboration. Now the indigenous technology has changed the scene. The experience, expertise, skill and all that emanating from the indigenisation have strengthened the base of the chemical industry to a great extent. Thus, the impact of import substitution on the growth and development of chemical industry in India is quite considerable and significant.

8.6. Problems or implications of import substitution

The limitations to have import substitution

policy or strategy successfully executed are varied and many. For example, it fails to free the economy from dependence on the world economy. The process of import substitution has the tendency to "get stuck" without generating any linkage effects. It cannot completely dispense with all the imports and be self-sufficient in every respect. It sometimes imposes rigidities resulting in creation of monopoly structure. It cannot be justified if the cost factor is not favourable. There will be a retaliatory measure resorted to by the importing countries by way of banning the goods of exporting countries through adoption of the protectionist policies or measures such as tariffs and quotas. It results into the "beggar thy neighbour" policy. It thus leads to distortion of the pattern of resource allocation with high rates of protection.

Despite these drawbacks, however, it could be safely stressed that every developmental endeavour involves cost. Rigidities are more apparent than real, in that proper regulations would help get over the problem of monopoly rearing its unwanted head. The fear that it leads

to distortion of the pattern of resource allocation with high rates of protection is unfounded and it is merely a misapprehension. It is the judicious use of this strategy that is of predominant importance and prime concern.

Its application in defence industry is unique in itself. The closely guarded secret process in the defence sector needs to be properly protected and timely exploited or implemented. The process development and other details have got to be kept in close custody, lest the entire safety, security and stability of the country would be lurched in peril, let apart the economy alone.

It is necessary to take note of certain norms or standards required to evolve this strategy in the best interest of the country. It should thus be seen that the indigenous products should in no way be inferior to global standards. The prices should be comparable and competitive. Constant research and development efforts should be made to evolve newer, cheaper and better technologies.

8.7. Empirical studies in select chemicals and emerging pattern of import substitution

Chemical industry embraces a host of myriad chemicals. It is, therefore, almost impossible to undertake a study of all the chemicals in the light of their exports and imports in terms of their quantity and value. The period of study also has got its own limitations. As such, twelve chemicals viz. natural yeasts, methanol (methyl alcohol), ethylene glycol, monochloroacetic acid, dibutyl phthalate (DBP), dicctyl phthalate (DOP, citric acid, lactic acid, p-toluidine, aminoacetic acid, acetanilide and caprolactum, have been chosen for our study. It would be seen that these chemicals are agro-food or agro-based industry oriented. These are, therefore, of special significance.

The period chosen is of four years (1973-74, 1974-75, 1975-76 and 1976-77). It is observed that during the quaternary period of our study the total amount of the 12 chemicals exported was to the tune of 472454 kg at Rs.4207279 and imports amounted to 47338501 at Rs.184872741. It is clear

from the figures that there is a great potential for import substitution that would save a huge sum of money (Rs.180665462) and foreign exchange outgo to that extent could be ceased forthwith. Besides, a sound team of experts could be had. Thus, the adept technical man-power, requisite experience, most sought-after expertise, engineering, design and other capabilities would be the outcome to the great advantage of our national economy.

It is abundantly clear that the strategy of import substitution is ubiquitous and universal. The technological growth is very closely connected with the industrial advancement. In fact, technological development is part of import substitution.

Technology is an input that is reflected in output. It is useful knowledge pertaining to the art of production. It is inherent in maximum output with minimum input. It is related to more output with the same input or same output with less input. And hence the indigenous, relevant, intermediate or appropriate technology gains in a vital importance and a pivotal position. Indigenous technology can

be said to be the one that makes the fullest possible use of local resources for its application to accelerate the pace of industrialisation. Foreign, alien or overseas technology is imported technology. Technological assessment is essential to evaluate its application potential. Foreign collaboration is of great significance as all the things under the sun cannot be produced at one place. The technology so developed needs to be transferred for its utilisation. The indigenous technology is of immense importance. It will have to meet the local requirement fully. It will use all the available resources - men, money, material, machine, energy and equipment. There is no reason why, all things remaining the same, the indigenous technology should not be as good as, if not better than, the overseas technology.

It has been amply vividly revealed that there are tremendous potentials inherent in import substitution. Its application as a strategy has been exceedingly useful to make spectacular strides in the process of achieving accelerated pace of industrialisation.

8.8. Main findings

After having had a detailed study of import substitution in relation to chemical industry, the following conclusions come to the forefront. These conclusions or main findings are enumerated below.

(1) Import substitution has been instrumental and conducive for accelerating the pace of industrialisation.

(2) It has sown the seeds of self-reliance and self-sufficiency. In other words, it has taught the lessons of independence in economic thinking and action or deed.

(3) Both the government as well as private bodies have taken to heart this strategy. As a result, this strategy has been adopted as one of the industrial policies of predominant significance. There is thus an increasing tendency or trend in production and productivity adding up to efficiency and effectivity or effectiveness.

(4) A relatively high level of industrial investment and technological skill has now been

accumulated in a number of less developed countries as also the developing ones. The indigenous technological development has brought in its train a team of eminent scientists, technologists, entrepreneurs, technocrats, engineers and managers. They have been well groomed, having learnt the lessons going thrcugh all the stages of teething troubles. These skilled personnel are an asset to the ccuntry. There is, thus, generation of an expertise relevant to our socio-economic conditions. The technical expertise developed has been of great advantage as well.

(5) The research and development capabilities have boosted up the morale of our entrepreneurial class. This has resulted in the enhancement of utilisation of our own research and development efforts for rapid industrialisation. The element of self-confidence and faith in the indigenous projects is a unique achievement. The government have set up a chain of research laboratories. This is the yeoman service done to the humanity as a whole and the entrepreneurial class in particular.

(6) The capabilities for capacity utilisation is indeed a grand attainment, in that earnest efforts are made to see that no capacity is left idle or under-utilised. This is of utmost significance. Full capacity utilisation leads to proper and optimum use of the resources. This is a laudable objective.

(7) The foreign exchange shortfalls are being minimised. Of course, as at present, the condition is comfortable in view of remittances made by Indians abroad. But the trend that has been set in motion as regards conservation and judicious use of foreign exchange has been of immense value. It should be remembered that this element of conservation struck its deep roots into the economic system of India mainly because of the desire for accomplishment of the objective of self-reliance. This helps in circulating the domestic currency within the country, obviating the need to go with a begging bowl for aid, loan or credit, to the minimum extent possible, which are not without strings and politically motivated as they are.

(8) The scientific and technological advancements are of great significance. The indigenous or

appropriate technologies relevant to our existing socio-economic conditions have raised our capabilities in technological self-reliance. Further, the technological obsolescence is being got over by way of augmenting the absorption capacity. The rural oriented technologies such as gobar gas, solar energy are of vital importance. As also, big fertiliser complexes have considerably contributed to harvest the bumper yield from the agricultural farms and fields. The weedicides and fungicides do not play a small role. Of course, every technology would bring in its train some attendant side-effects such as air pollution, water contamination and sound pollution but that is what is life. Human being has come to a pass where it is fully prepared to take the calculated risks. As such, further efforts are made to nullify these evil effects. This is how there emerge benefits accruing from the technological and scientific progress made with a view to accelerating the pace of industrialisation.

(9) The import content is kept to the minimum. The developmental and maintenance import is also on the wane as a result of our own breakthroughs

made in this direction. For instance, heavy machineries on the one hand and sophisticated high precision devices on the other are being manufactured in considerably large quantities dispensing with such equipment and services from abroad.

(10) The generation of employment opportunities has been a significant accomplishment. In view of various schemes relying heavily on labour intensive technologies, the surplus labour is put to proper use. The dual objective of industrial advancement at the same time gratifying the needs of the labour is increasingly being fulfilled.

(11) It is through adoption of the import substitution strategy that the process of adequate generation and enough mobilisation of resources could be carried out most efficiently, effectively as well as expeditiously in the larger interest of the overall national economy.

(12) It must be underlined that the gains of economic diversification do not come free. Structural corrections do impose cost, but the cost of failing to undertake these corrections is often higher. It is, therefore, necessary that initial expenses

should be borne and a base for advancement had.

(13) Import substitution is clearly not the panacea for all the ills of under-development. But neither is it an instrument which deliberately wastes resources in poor countries. It is one more economic policy, at the same time fallible and useful, whose benefits can be enhanced and drawbacks reduced by appropriate subsidiary policies. So judicious use of this strategy is of paramount significance.

(14) The increased availability of capital, skills and technology in many less developed countries, in part helped by previous import substitution, is affording an important opportunity to expand and diversify the industrial output.

(15) Managing time and managing available opportunity are the two basic problems which any developing nation will experience and adopting the strategy of import substitution the way in which we want to do that has been expounded in our study. Import substitution will give a solution for even averting general crisis in the economy and this should be looked upon as a "wonder opportunity" for

shortening the time-lag between the present situation and the economic advancement which we want to achieve. So managing this opportunity need not be an uphill task. If we adopt appropriate import substitution strategies, it will lead to necessary advancement. Therefore, coming up in the race of competition this would greatly help.

8.9. Suggestions

A new strategy for import substitution should be based on the following:

(A) Enlightened corporate policy of source development: Many organisations like Bharat Heavy Electricals Ltd., Hindustan Machine Tools, Larsen and Toubro, etc. have established company policies for source development. Financial and technical assistance is provided by some of these companies for developing indigenous suppliers. Experience and interaction with senior executives attending management development programmes indicate that several organisations pay only lip service for source development and they strongly feel that tangible results will be obtained only if the

development of suppliers are interwoven with the long term corporate plans of the buying organisation.

(B) Standardisation of equipments and designs: Standardisation is indeed the basic necessity for mass production. It is a continuous and time consuming process. In the case of industrially developing countries, a systematic approach for establishing priorities and a total view of industrial sectors is warranted. All-out and determined efforts to adopt Indian standards and replace foreign specifications is highly essential. Inter-company standards could be evolved instead of waiting for standard from the ISI by way of establishing industrial working groups like electronics, heavy engineering, light engineering, and chemicals. It is also essential to standardise the design of production machinery. Large organisations having collaboration with more than one country should have a hard look at the production line with a view to standardisation. Engineers should be encouraged to adopt value analysis techniques, which is a fruitful area for import substitution.

(C) National technology policy: The country spends a huge sum of money every year in the import of spare parts. While importing the capital machinery adequate precaution should be taken to buy the drawings as well. The lead time for the clearance of import requirements, which is very long, should be curtailed to the minimum to expedite the clearance. The central organisations like Directorate General of Technical Development and Chief Controller of Imports and Exports should take initiative in setting up banks or cells for critical imported raw materials and spare parts. Obviously, this will reduce not merely the imports at the macro level but also investment on the inventory at the micro level.

Import substitution is an urgent national imperative need. Efficient, effective and expedient progress in this attempt requires close co-ordination, candid co-operation and mutual understanding between government, industry and scientific institutions, so that there is a harmonious blending of effort and happy integration of interests.

Import substitution is like a double-edged sword that has got to be very meticulously wielded,

so that it does not harm the user of this strategy in industrial advancement. It needs, in other words, to be very judiciously used, lest the act of too much of reliance on protectionist policy would invoke similar retaliatory measure from other concerned countries, thus defeating the very purpose of achieving self-reliance.

It is indeed gratifying to note that chemical industry claims the fourth position. It is observed that today India has the third largest complement of qualified scientific and technical man-power in the world, next only to the Soviet Union and the United States and hence a proper technology policy should be formulated and implemented so as to improve the present position in Rural India and also Urban Regions.

The Chairman, National Committee on Science and Technology, Dr. Atma Ram, has been indicating that so far the government had come out with a science policy statement but an emphasis on the technology aspect had not been given due attention. This needs to be done forthwith so as to evolve relevant technology and implement it in the

larger interest of community.

Exchange of skilled craftsmen and artisans on lines similar to the exchange of scientists could be mutually beneficial and this should be properly encouraged.

The mental attitude of entrepreneurial class to treat indigenous process with spite and at the same time having undue craze for all that is "Foren" should go away. Thus, the sense of economic nationalism should reign supreme. The proper economic culture is the need of the hour. The concrete confidence in our scientists and technologists on the one hand and the labour on the other would only help move the economy on the proper path of progress with the requisite built in dynamic mechanism.

Government should make a determined and sustained effort to foster the process of import substitution by way of keeping awards to the best books, popular articles and other relevant publications in a similar manner as is done in the case of import substitution processes. This will act

as an incentive. It will thus help sowing the seeds of self-reliance. It will, therefore, go a long way in creating a proper economic culture and economic nationalism. There is at present a dearth of such a positive thinking on the part of entrepreneurs. Even consumers have been utterly lacking in this sense, which is of immense value. Enough literature would definitely prove to be a boon to the society. As such, there is a dire and crying need as at present of regular publication on the lines of USDA Bulletin, giving detailed data pertaining to import substitution. This would help the budding and burgeoning prospective entrepreneurs to make their timely decisions to enter into the production of those items that have great use and profit potentials. This would have dual purpose served. On the one hand, the entrepreneur would have a favourable and conducive climate where he could flourish and make copious progress. On the other, the society at large would reap rich dividends arising out of local production and availability of such items, eventually culminating in the corresponding curb on the import as well as conservation and saving in foreign exchange to

that extent.

There should be enough publicity given to the importance of import substitution and ample public awareness created by holding popular seminars, workshops, conferences and get-together of industrialists and government executives. Here they can air their views freely and frankly. This will help create a climate conducive for generating the most sought-after convenial and amicable atmosphere for venting and exchange of views. The mutual recriminations, misunderstandings and differences could be ironed out or sunk, burying the hatchet once for all. A friendly dialogue across the table would restore, harness, foster and sustain the mutual confidence.

Right from the beginning a sense of self-confidence and self-reliance should be inculcated or imbibed in the minds of the students. At the formative age they are very much receptive and susceptible to such improvements. Thus, out of these will emerge and sprout forth entrepreneurs of international repute like the Tatas and Birlas. The lack of proper leadership is very much there these

days. It would not be out of place to suggest here that an earnest attempt be made and possibilities explored in their proper perspective to usher in in curricula/syllabi and adequate provision made to impart the knowledge highlighting the over-riding significance and indispensability of the element of self-reliance and self-sufficiency. Like Japan we will have thus a team of dedicated and devoted workers, moulded well in time, who would be helpful in achieving all-round development and particularly so in the national economy. Thus, the coming generation would have all the healthy features and buoyant base, nipping in the bud the evils of mutual recrimination, that are at present seen spreading like a wild fire. What is woefully lacking and desperately needed is a dynamic and dedicated leadership which can weld a group of managers into a well integrated and co-ordinated as well as fully energised team to meet the momentous challenges that encounter the growing national economy. This needs to be dealt with on a war-footing.

Appointment of a panel for effecting

judicious utilisation of import substitution strategy is urgently warranted particularly because of the fast deteriorating global socio-economic and techno-economic conditions. It should be the duty of this Panel to take both long term as well as short term views and optimum benefits reaped. It should have broad framework comprising technical, economic and fiscal policies for the promotion of import substitution, leading to overall development of the national economy. "Thank tanks" should be established to have proper technology evolved. Further, "Technology utilisation centres" should be opened and their use made to the fullest extent possible in order to utilise the technology evolved.

Adequate generation and enough mobilisation of resources should be effectively, efficiently as well as expeditiouslt carried out to quicken the process of import substitution with a view to accelerate the pace of industrialisation.

Wherever necessary and expedient, without any sort of reservations, overseas technology may be imported and sustained efforts made to absorb it into our socio-economic system with the requisite

modifications, and improvisation, thereby converting it ultimately into an indigenous or appropriate technology. Our National Laboratories could be given this assignment who have by now proven capabilities to shoulder this responsibility with concrete confidence over a period of around three decades now.

Now that the country, right from its independence in 1947, has been endeavouring its best in one form or the other to be self-reliant, a "take-off" stage has been reached by it. It is particularly more so in the field of chemical industry. There is a systematically evolved and eventually established chain of government research laboratories/institutes, as cited above, devoted to research, design and development (RDD) work. A casual look at the Pune-Bombay belt and in and around Maharashtra will give a definite impression that it is virtually an area humming with business activity. The skilled and well trained scientific and technical man-power should be used in such a way that they contribute their mite to the best advantage of the national industrial development.

They are actually the very active motive force to evolve, adopt, improvise, modify, diversify, modernise, absorb and finally give a practical shape to the relevant technology. Government policy should, therefore, be so harnessed and geared as to promote and further strengthen the base in order to help the process of import substitution to strike its roots deep into the overall economic system. Thus, an inbuilt dynamic import substitution mechanism be fostered that would be a permanent footing or feature or a spring board to have a great leap forward in the direction of accelerated pace of industrial growth and development. Extensive efforts should, hence, be made not merely to attain self-reliance through import substitution but areas should be identified for exports keeping in mind quality, quality and cost factors in the very face of stiff competition from various fronts.

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