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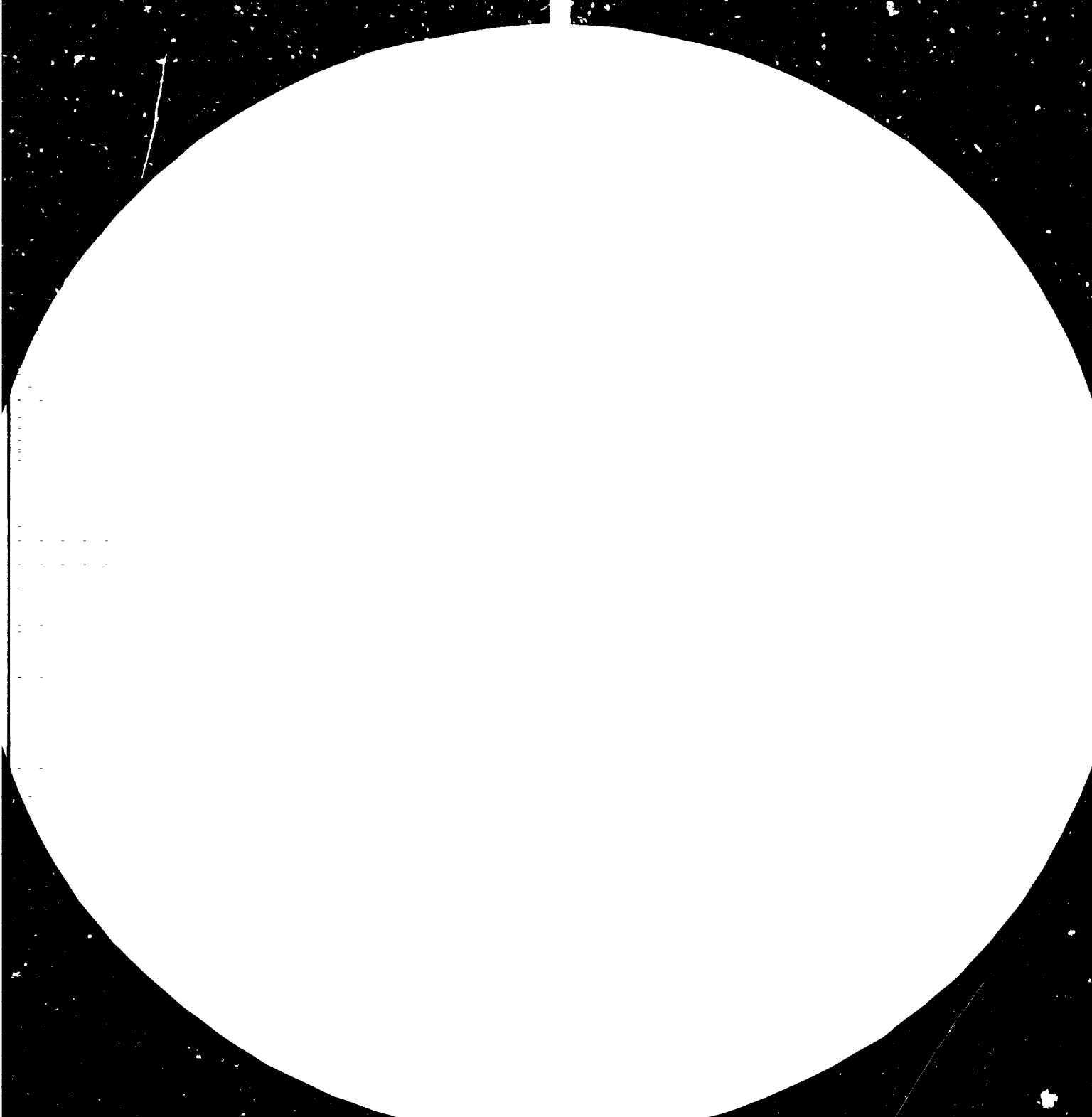

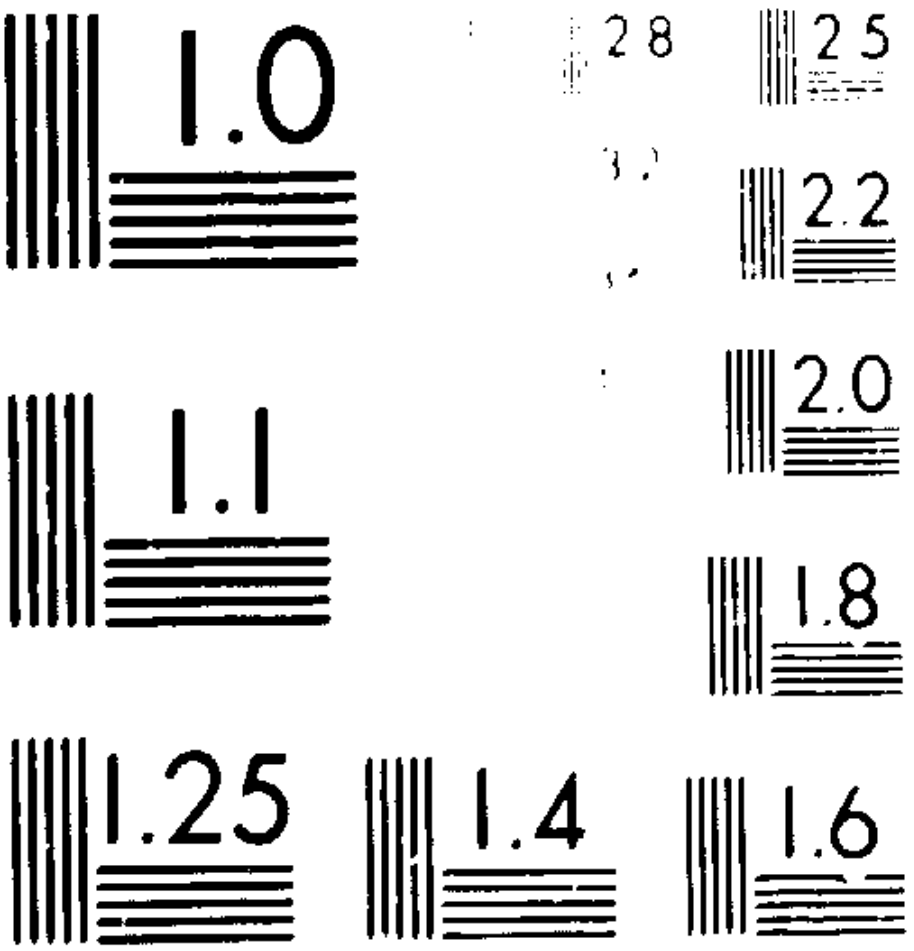
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Preface

Since 1967, the United Nations Industrial Development Organization (UNIDO) has adhered to its mandate "to promote and accelerate the industrialization of the developing countries" by responding to requests for technical co-operation in all aspects of industry from the Governments of those countries.

This commitment to industrialization as a means of improving the living standards of nearly three quarters of the world's population, which was first outlined in November 1966 by the United Nations General Assembly in its resolution 2152 (XXI), has since been intensified. The Lima Declaration and Plan of Action on Industrial Development and Co-operation, which was adopted by the Second General Conference of UNIDO in 1975, called for an international effort to increase the developing countries' share of world industrial production to 25 per cent by the year 2000. This goal was further emphasized at the Third General Conference of UNIDO, held at New Delhi, India, in early 1980, with the adoption of the New Delhi Declaration and Plan of Action on Industrialization of Developing Countries and International Co-operation for their Industrial Development.

In the series of booklets *UNIDO for Industrialization*, of which this is one, an attempt is made to describe briefly the contribution of UNIDO, through its Division of Industrial Operations, to the industrialization of the developing world and to give examples of what has been done and will continue to be done to accelerate the process.

FINANCING UNIDO ACTIVITIES

The bulk of the costs of UNIDO administration and research, now approaching $US 48 million annually, is met from the **regular budget** of the United Nations, as are some lesser expenditures reserved for certain advisory and training activities. Once UNIDO achieves the status of a specialized agency within the United Nations family, it will cease to be funded from central sources of the United Nations and will rely on its own budget based upon contributions from its member States.

Technical assistance programmes for projects in developing countries, however, are funded from varied sources, the most important of which are summarized below.

By far the largest share of the field activities of UNIDO, some 70 per cent of the total, is funded from the **United Nations Development Programme (UNDP).** Thus, a high proportion of UNIDO field projects are subject to UNDP approval before implementation. Since the ultimate source of this money is the contributions of the member States themselves, both developed and developing, it can truly be said that UNIDO field activities are self-help programmes, initiated only at the request of Governments of developing countries and using funds to which many developing countries themselves contribute. These funds are allocated to particular countries from UNDP sources up to a predetermined amount known as the indicative planning figure (IPF). They cover the whole spectrum of United Nations assistance to those countries, industrialization being only one of many programmes needing financial support.

Country programmes normally have a five-year span; and the available funds, which vary from country to country and are weighted in favour of least developed countries, must be allocated to specific projects within a country during the five-year period.

Special Industrial Services (SIS) funds are confined to a narrow range of expert services provided for unexpected high-priority projects that are called for from time to time. The programme is restricted to short-term projects of limited cost, and during recent years $US 3.5 million has been set aside annually to support it.

The **United Nations Industrial Development Fund (UNIDF)** was created to finance innovative projects, preferably projects having a multiplier effect. The Fund consists of contributions pledged by individual Governments, and in some cases the purpose of the contribution is specified. Pledges are made in convertible and non-convertible currencies.

Trust funds are provided by participating Governments for specific projects to be executed by UNIDO in accordance with agreements reached with the contributing countries. They are used, typically, for technical assistance, expert services and specialist training.

The small **regular programme of technical assistance** provides funds for types of technical assistance that either complement other programmes or do not lend themselves conveniently to alternative means of financing. In particular, this type of funding permits a certain degree of flexibility in spending, since the allocation of the funds available is entirely under the control of the principal policy-making organ of UNIDO, the Industrial Development Board. Programmes are designed to reflect the emphasis on special measures for the least developed countries, on technical co-operation among developing countries and on establishing and strengthening industrial training facilities in developing countries.

Petrochemicals

The petrochemical industry is concerned with the production of four main groups of products: plastics, synthetic fibres, synthetic rubbers and detergents, which together have an enormous range of applications. The industry is largely based on crude oil and natural gas. It utilizes about 5 per cent of world production of crude oil and natural gas, a proportion expected to increase with the expansion of the industry, although not to a significant degree.

Although major petrochemical complexes are to be found in the highly industrialized countries and the more advanced developing countries, the increasing needs of other countries for the end-products of the petrochemical industry, plus the high degree of innovation and adaptation of petrochemical materials, indicate that some priority must be given to the establishment of the industry in most developing countries. Ideally the industry should be based on existing local petroleum or natural gas sources, but otherwise on imported petrochemical materials. Establishment of the industry will lead not only to a considerable saving of scarce foreign currency but will also create jobs locally and provide a base for industrial expansion.

The petrochemical industry is as modern and as dynamic as the petroleum industry itself on which it is largely based. Annual production increased dramatically for years, rising from a few hundred tons during the early 1920s to about 3.3 million tons in 1950 and to 70 million tons by the end of 1974. During the 1970s the explosive rate of growth slackened somewhat when the developed industrial countries had finally satiated their domestic markets and met export demands, but over the whole spectrum the industry continues to expand at an impressive estimated 14 per cent per annum, largely because of the continuing discovery of new applications for petrochemical products and the establishment of new petrochemical industries in developing countries. After little more than a half century of existence, petrochemicals stands among the first half dozen of the world's great industries; it is a major contributor to the improvement of living standards, a major employer of labour, a major cost-stabilizing factor in a world of spiralling costs, and the producer of a raw material capable of almost unlimited development.

Petrochemical end-products are not sold directly to final consumers, but are utilized as inputs in processing industries such as plastics, textiles and tyres. In most developing countries processing industries using petrochemical end-products precede primary petrochemical production.

The output of the four main end-products of the petrochemical industry is shown below for selected years (millions of tons).

End-product	*1960*	*1970*	*1974*	*1975*
Plastics	7.0	30.2	44.6	38.5
Synthetic fibres	0.7	5.1	7.5	7.5
Synthetic rubbers	2.0	5.9	7.7	7.4
Detergents	3.5	9.0	11.0	10.8
Total	13.2	50.2	70.8	64.2

PLASTICS WEEKS: CARRYING THE MESSAGE

As a contribution to the wider dissemination of ideas in modern plastics and to help stimulate industry, UNIDO organizes seminars called "plastics weeks" in various countries, where visiting experts make presentations of their particular technologies in the plastics field. Each presentation includes a demonstration, usually carried out in industrial premises, followed by a discussion between the visiting specialists and local plastics personnel. The theme of each week is tailored to local circumstances.

The local plastics industry makes the arrangements for a plastics week. It nominates the local personnel participating in the seminar and provides lecture and workshop facilities. The visiting team usually comprises up to six specialists. Lectures, presentations and discussions take up the first half of the week, while during the second half each consultant visits local factories and workshops to advise and demonstrate technical matters at the work site.

Plastics weeks were held in 1978 in Egypt and Turkey, in 1979 in Mexico and in 1980 in Indonesia.

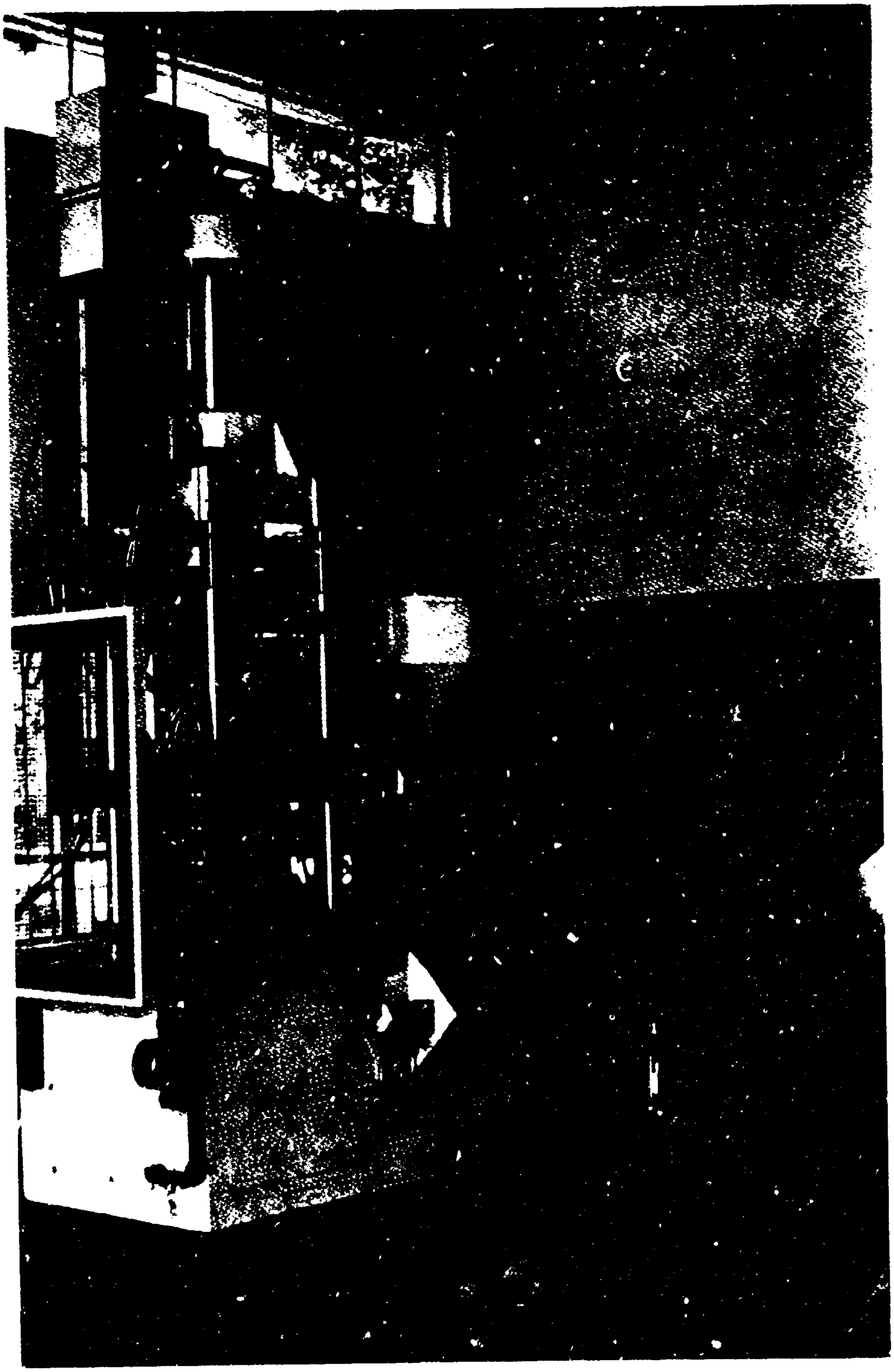
PETROCHEMICAL RESEARCH AND DEVELOPMENT CENTRES

Countries developing their existing petrochemical industries or contemplating the establishment of new ones need to establish research and development centres at which the various technical and technological problems can be studied; where personnel can be trained for all levels of operation; where market requirements can be professionally assessed; and where problems of management, quality control, maintenance, utilization etc. can be kept under constant review.

UNIDO offers assistance in the setting up of such centres by:

(a) Providing internationally recruited experts to advise on all aspects of development;

(b) Training technical staff either locally or at industrial centres abroad individually or in groups;



Compression moulding machine, India

(c) Supplying equipment for research and development, pilot or demonstration plants, or quality control laboratories.

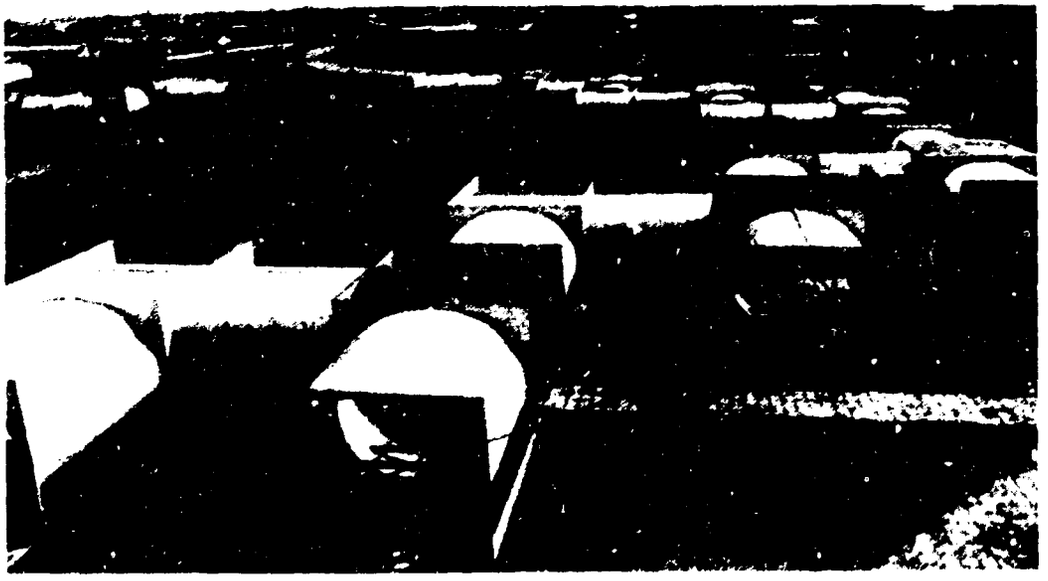
Some of the petrochemical research and development centres that have been assisted by UNIDO are:

Argentina: Petrochemical complex Bahia Blanca (ongoing)
China: Chemical engineering centre
Egypt: The Suez Oil Processing Company Petroleum Development Centre (1978)
Peru: Integrated petrochemical complex at Bayovar (1976)

PLASTICS DEVELOPMENT CENTRES

The establishment of central institutes is essential for developing markets for plastic products and maintaining good product quality to sustain them. These centres, which must have the support both of Governments and the producers of plastics, require expert staff specializing in development and the provision of technical services to users; and they must be primarily concerned with the establishment of acceptable standards for all plastic products that will satisfy existing users and open up new markets. The criteria of good quality and performance characteristics are of first importance in the comparatively new and not yet fully developed field of plastics.

In most developing countries agriculture is among the most important economic sectors. Consequently, a plastics development centre would concern itself with the application of plastics to a wide spectrum of rural development, e.g. crop cultivation, packaging, water storage, irrigation, soil purification, agricultural buildings and housing units and grain silos.



Plastic village taking shape in Ecuador

Examples of plastic development centres established in various developing countries are given below with the principal field of interest indicated in brackets:

Algeria (plastics for greenhouses)
Bangladesh (pilot demonstration plant for product testing)
Cyprus (plastics in agriculture)
Egypt (plastics in general)
India (materials and product testing)
Mexico (plastics in agriculture)
Upper Volta (plastics composites for low-cost housing)

SYNTHETIC FIBRE RESEARCH AND DEVELOPMENT CENTRES

The sophisticated technology of synthetic fibres changes rapidly and constantly. To keep pace with this advancing technology and to encourage the use of synthetic fibres in order to reduce dependence on cotton as a raw material for the textile industry, UNIDO has promoted demonstration plants for the production of synthetic fibres such as nylon and polyester.

The objective of such a project is to establish a service, oriented to the interests of the textile industry as a whole, wnich in the field of synthetic fibres can carry out systematic programmes of experimental work and training, collect technical information, act as a non-partisan consultant, and provide an impartial system of communication between fibre producers, textile mills, the textile trade and consumers to ensure that all efforts in this field are efficiently directed.

Co-operation with the Silk and Art Silk Mills' Research Association at Bombay, India, and the Textile Academy at Beijing, China, are examples of this type of activity.

CENTRES FOR DEVELOPMENT OF TECHNOLOGY OF PLASTICS COMPOSITES AND PRODUCT APPLICATION

The technology of composite materials, comparatively new even in industrially advanced countries, should prove especially valuable for the development of less advanced economies that have a large labour force. Composites technology is labour intensive and science-based, and provides materials with physical, chemical, mechanical and electrical properties that offer a very wide range of applications.

The term "composite" or, alternatively, "plastic composite" is usually taken to refer to fibres or reinforcing materials surrounded by matrix resinous or plastic substances resulting in properties superior to those of the non-reinforced substances. These materials are usually known as reinforced plastics or fibre-reinforced plastics, laminates or filled moulding compounds. Typical composites are:

(a) Fibreglass reinforced plastics: commonly used as a structural material with a wide application in housing, tubing, containers, boats and vehicles;

(b) Carbon (graphite) reinforced plastics: widely used in the aerospace field, transportation, boat construction and industry. They are characteristically as stiff and strong as steel but five times as light;

(c) Aramid (kevlar) reinforced composites, a fibre similar to glass but not self-abrasive: widely used in tyre reinforcement, hoses, engine beltings, ropes, aircraft applications and electrical products.

UNIDO can help in procuring specialized equipment for producing, fabricating and testing these materials. It can provide training by foreign specialists, and it can place selected nominees for fellowships within the industry. It can organize instructional tours by senior personnel to industrial plants in highly developed countries, and it can arrange international conferences and workshops at which foreign scientists and personnel from developing fibres and plastics industries can meet and exchange information.

In India, the Centre for Development of Technology of Fibres, Composites and Product Application was founded with the assistance of UNIDO. A centre for fibre technology is now at an advanced stage of planning in Brazil, where it will serve the national aerospace industry. Other centres are expected to follow.

COMPOSITE MATERIALS FOR LOW-COST BUILDING SCHEMES

A basic element in the United Nations' call for a healthy and tolerable life for all the world's population is decent housing. Plastics have already proved a suitable medium for many building applications in industrially advanced countries, including use in emergency housing. Designers and manufacturers of plastics have been active in producing systems of socially acceptable low- and medium-cost housing units for mass production. Hence UNIDO has been paying particular attention to the role of plastics and plastics composites in the provision of low-cost housing in developing countries.

One such system already approved using plastics composites, simple in design, requiring only basic building equipment and a limited range of plastic materials, besides making very low demands on building skills, is the Patfoort Building System, with which UNIDO has already achieved considerable success with projects in Cyprus, Ecuador, Upper Volta and Uruguay. It has several advantages – it is easy to construct, uses a limited range of readily available materials, requires no foundations and can be constructed before water and power facilities are installed. It can be used advantageously in training workers quickly and in introducing plastics

technology, which can be adapted and developed as part of the host country's industrial programme.

An important subsidiary advantage of the Patfoort system is that the same technology can be applied on site to the construction of silos, tanks, containers, sewage or water pipes and catchment roofs for the recovery of rain water.

Examples of some such UNIDO projects are found in Cyprus, Ecuador, Mexico, Upper Volta and Uruguay.

NATURAL AND SYNTHETIC RUBBER: PRESERVING A BALANCE

The strain on the world's ecology imposed by the growth of population and subsequently the growth of consumption of non-renewable resources makes the preservation of non-renewables, such as oil and natural gas, a matter of grave concern. One way to conserve non-renewable resources is to further the production of renewable raw materials, in this case natural rubber. Natural rubber plays an important role in the world's economy, and within the countries in which rubber is grown the livelihood of millions of small farmers and land workers depends on it.

The prosperity of the natural rubber industry relies upon its ability to match the requirements of manufacturers at a time when rapid development is demanding great adaptability, a challenge that is already being met by producers of synthetic rubber, a non-renewable raw material. To redress the balance and increase the competitiveness of natural rubber by developing new forms that will satisfy manufacturing needs, UNIDO, in co-operation with the International Rubber Research and Development Board (IRRDB) and the Association of Natural Rubber Producing Countries (ANRPC), initiated a project to develop thermoplastic, powdered and liquid forms of natural rubber. The project was carried out by the Malaysian Rubber Research and Development Board (MRRDB), with funds provided by the Federal Republic of Germany. The results of the project are being shared by the co-operating parties.

Composite materials combining both natural and synthetic rubber have been used for a long time, and many familiar products today feature them in their formulation; the basic properties of the product are thereby enhanced. This process will become increasingly familiar as new forms of natural rubber are developed.

PRODUCTION OF RESINS FROM NATURAL PLANTS

As with natural rubber, non-renewable sources of industrial resins must be protected and existing supplies supplemented with resins obtained from growing plants. UNIDO, in co-operation with the Centro de Investigación en Química Applicada (CIQA), Mexico, is undertaking basic and applied research in this field. The aims are to exploit available resin-yielding plants in arid areas, to develop industrial use for such natural products, and to utilize natural resins in the modification of natural fibres.

For further information on UNIDO activities in the field of petrochemicals, contact:

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