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United Nations Industrial Development Organization
Department of Industrial Operations
Industrial Operations Technology Division

PROJECT ACTIVITIES AND PRIORITY AREAS

An Introduction to
the Industrial Operations Technology Division
and its technical assistance programmes in the sectors of
agro-based, chemical, engineering and metallurgical industries

June 1992

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WHO'S WHO
AGRO-BASED INDUSTRIES
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ENERGY AND ENVIRONMENT RELATED PROJECTS
NEW CHALLENGES AND OPPORTUNITIES
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INTRODUCTION

Industrialization, though not the only route to development objectives, is nonetheless the means of producing a large variety of goods and services, of ensuring adequate employment opportunities, generating income and improving the quality of life. With the growth of industrial potential, as represented by more effective exploitation of natural resources, improvement of human skills and expansion of technology and its adaptation, the modern industrial sector with its sophisticated processes will develop rapidly to meet, primarily, the demand for products for international trade.

Since its inception in 1967 UNIDO has been fulfilling its mandate to promote and accelerate the industrialization of the developing countries by responding to and inviting requests for technical co-operation in all aspects of industry. This commitment to industrialization, as a means of improving the living standards of nearly three-quarters of the world's population, continues and grows each year. UNIDO is following international developments and trends with great attention. The new political and economic environment in eastern European countries and in a number of developing countries require that special emphasis is placed on assisting industries to become competitive in market economies and converting military industries to civilian use. Rationalization and modernization of production is of utmost importance as is the upgrading of management skills, to pave the way towards privatization.

Global warming and climatic changes are issues of concern to all ecologically minded human beings. The deterioration of the environment to which industry is a major contributor represents one of the greatest challenges to UNIDO in its strive for industrialization. Thus, UNIDO has fully committed itself to environmentally sustainable industrial development which was manifested in the UNIDO environment programme and approved by UNIDO's Third General Conference in 1991. Strongly linked to economic growth as well as to environmental concerns is the supply and use of energy. A comprehensive energy programme is being formulated to assist developing countries to secure their need for energy supplies to meet their economic growth targets by using new and renewable sources of energy and, at the same time, applying energy conservation technologies.

Technical assistance delivery is the mandate of the Department of Industrial Operations (DIO), embracing three Divisions: Industrial Services and Institutions (covering industrial planning, institutional infrastructure, industrial management and rehabilitation), Industrial Operations Support (covering industrial human resource development, feasibility studies and project personnel recruitment and administration) and Industrial Operations Technology Division (IO/T) which covers the basic industries, namely agro-based, chemical, engineering and metallurgical industries. Activities in the fields of environment, energy and processing and application of new materials horizontally reach into all four branches of IO/T. The Industrial Technology Support Unit co-ordinates these activities.

The implementation value of projects carried out by the four IO/T Branches varies between 70 - 80 million dollars per year. Projects worth some 110 million dollars are approved per annum. About two times this figure are

requested, negotiated and prepared (these are considered pipeline projects). From preparation of the project concept to project approval 2 - 3 years may elapse to negotiate the technical and financial inputs and to secure the required funds. At the end of 1991, IO/T had 811 projects in operation and 686 projects in the pipeline.

NATURE OF PROJECTS

Traditionally, the nature of projects implemented involves all aspects in the transfer of technology related to the establishment of new industries and the improvement of already existing industries in their performance and management, keeping in mind the economic, environmental and social acceptance of industries.

(a) Rehabilitation/restructuring and upgrading of small and medium scale industries

This sector constitutes a major part of activities carried out in developing countries, since most of them have industries at the small and medium scale level. Every effort is made to achieve plant rehabilitation with minimum economic investment. Any plant modernization programme needs to be market-oriented, i.e. it should aim at product diversification and selection of the desired product-mix, according to market demand. The introduction of quality control measures are indispensable if a company aims at export or wishes to improve capacity utilization and efficiency of operation. The improvement of management skills for key decision managers is often a pre-requisite for the success of the rehabilitation programme. The introduction of low-waste/non-waste and energy-saving technologies as well as technological aspects in equipment maintenance and training are also key issues. Plant maintenance as a means to increase plant availability and to reduce operating costs plays an ever increasing role. Plant maintenance is particularly effective when introducing computerized maintenance management systems, be it on PC (LAN network), minicomputer or mainframe.

(b) Assistance in creating new industries

The development of an industrial sectoral infrastructure is an important consideration when planning new industrial units. Assistance covers national planning of industries through elaboration of master plans, techno-economic and cost-benefit studies; laboratory and pilot testing of local raw materials to identify the optimum process routes (valorization of raw materials); provision of skilled personnel, technology transfer, plant design and advice in equipment acquisition. Already in the very first planning stages the transfer of environment-friendly and energy-saving technologies receives particular attention.

PRIORITY AREAS FOR PROJECT ACTIVITIES

Technical assistance is a service rendered during the execution of the project and/or afterwards to those national entities in a developing country which take active part in the industrialization process. Such services provided by IO/T consist essentially of the entire range of tasks needed to be fulfilled during establishing and/or functioning of

national industries as well as infrastructure support services. The needs of the beneficiaries are assessed for technical assistance and also the *modus operandi* is defined in accordance with UNIDO's mandate with the specific aim of generating outputs of required accuracy and cost-effectiveness.

In line with recent international developments the technical co-operation programme addresses one or more of the following closely-linked priority issues, with particular emphasis on environmental considerations, energy conservation and privatization.

TRANSFER OF TECHNOLOGY, WITH SPECIAL EMPHASIS ON CLEAN AND ENVIRONMENTALLY-FRIENDLY TECHNOLOGIES

Environmental aspects in rehabilitation of existing plants or design of new industries are of major concern in IO/T and due regard is paid to the issue by selecting technologies to fulfil environmental requirements (adherence to environmental standards) or by providing additional equipment designed to reduce the negative impact of industry on the environment (especially air and water pollution). Increased awareness of environmental issues is disseminated through training programmes, seminars and workshops. While training of technical staff and operators is very important, senior management awareness and commitment must be aimed at in the first place to build up a plant management structure which positively links production, pollution control and environmental management. IO/T can assist developing countries in the **proper choice of technology to reach optimum environmentally friendly operations with minimum investment**. Saving in energy and thus reduced operating costs often offset the additional investment requirements within a short time-span.

◘ *Energy conservation and saving*

Since energy consumption is closely related to the environment and in view of its importance to the industrialization process, a number of projects are implemented in this field, i.e. generation, use, conservation and saving of energy. Considerable attention is paid to the **development of new and renewable sources of energy** (energy generation from biomass, mini hydropower plants, solar and wind) with the aim of coping with unforeseen fuel shortages and reducing the threat of deforestation. Forests have traditionally been used as sources of wood fuel. Parallel to this, IO/T provides technical assistance to improve the efficiency, environmental acceptability and cost effectiveness of **using low grade coal** which is an indigenous source of energy in many developing countries. A number of projects aim at energy conservation in heavy industries, primarily through energy audits, computer-based energy monitoring systems, waste utilization and recycling. More details on IO/T's environment and energy related projects are provided in a separate brochure.

◘ *Waste utilization and recycling technology*

This issue is also closely related to the environment. Waste recycling provides the potential to regain or re-use certain materials and is becoming a substantial consideration in technical assistance programmes. A number of technological alternatives for utilization of wastes are available. **Recycling of wastes from plastics, glass, oil, metallurgical and paper industries** are very important examples of such activities. **Industrial effluent and waste-**

water treatment (e.g. to separate oil or treatment of tannery effluent) is another area of concern. The Joint UNIDO/APCTT* Workshop on Environmental Considerations and Waste Recycling in the Chemical, Metallurgical and Engineering Industries, held in Manila in December 1991 *inter alia* recommended regional co-operation and establishment of national waste treatment and recovery centres. Best practices for waste minimization, materials recovery and recycling, cleaner processing, etc. need to be implemented as a matter of priority.

- ***Water and waste water management***

- Water management and water planning

In many developing countries the ground water is scarce and any waste of water has to be kept to the absolute minimum. The selection of the most appropriate technology plays an important role and technologies that consume less water and entail the least loss of water (e. g. through vaporization) need to be chosen.

- Process water treatment

Owing to pollution the quality of river waters used for industrial purposes declines. At the same time the requirements on process water increase to improve the quality of industrial products. Rational use of water resources demands the introduction of more sophisticated process water treatment techniques (e.g. chemical pre-treatment, membrane technology through reverse osmosis, ultrafiltration and microfiltration).

- Waste water treatment

Special emphasis is accorded to water conservation, including reuse and recycling. Industrial effluent and waste water treatment is an area of great concern. IO/T also handles projects for design of complete waste water treatment systems and considers in-factory optimization procedures for waste reduction a far better solution than end-of-pipe waste treatment.

GUIDANCE TO INDUSTRIES FOR PRIVATIZATION

A number of industries, particularly in eastern European countries aim at privatization. Guiding industries towards privatization is a subject which embraces many activities. Both the financial and legal framework needs to be considered. After **identifying plants or units as promising candidates**, privatization will often only be possible after implementation of **rehabilitation/restructuring, upgrading and rationalization** programmes (for which near- and medium-term new capital requirements need to be determined), after **introduction of environmentally sound technologies, improved management and operational skills and capabilities**. Other pre-requisites for privatization are **asset valuation** and **clean technologies**.

When governments aim at privatization of large industries and integrated plants, the most promising units which would involve relatively less capital investment and little social disruptions need to be identified. Usually auxiliary plant units are the first candidates for privatization.

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* Asia and Pacific Centre for Transfer of Technology

With assistance and support from interested western industrial associations and companies UNIDO can arrange for seminars and study tours, assist in market surveys, identify technologies and related facilities requirements, prepare feasibility studies and may also investigate direct foreign investment and joint-venture potential.

- ***Upgrading/restructuring of research and development (R and D) institutes to support the Government's privatization process***

UNIDO has been active in assisting developing countries to establish or strengthen R and D centres to develop and adapt technologies according to raw materials availability and market capacity. These and other local institutions need to become self-reliant and should provide consultancy and extension services to the local industries to ensure their efficiency, to achieve an improvement of technology and to act as reference laboratories/centres for design and quality control. In the process of privatization of industries there is a need for R and D institutes to demonstrate their capabilities in planning technological needs, in training of personnel, and in providing advice. The institutes could also assist in the techno-economic evaluation of development or transfer of technology (e.g. by applying the COMFAR system, developed by the Feasibility Studies Branch of UNIDO for computerized evaluation of feasibility studies). In addition, they constitute a good potential for technical co-operation among developing countries (TCDC). To cope with these ever growing requirements an assessment of available technologies in the local R and D institutions of a given country should be made to identify equipment and services that can be provided. In a number of cases UNIDO will need to assist in restructuring of institutions so that they can effectively respond to "tomorrow's" industrial requirements.

- ***Establishment/reorientation of pilot plants (semi-industrial units)***

Such plants are required to translate favourable laboratory results to the industrial level and to serve as demonstration plants for the introduction of certain technologies, thereby establishing a sound basis for an investment decision. Alike R and D centres, available pilot plants will need to be reoriented/restructured into demonstration production units which are economically self-supporting advanced training and technology-transfer units, capable to support the privatization process. The establishment of specialized, advanced production lines and DPUs will be promoted within existing successful plants in order to minimize investment in infrastructure and administration, and ensure the efficient training of the operative and technical personnel.

- ***Training and Retraining***

Most of the technical assistance projects implemented by IO/T contain a training component; such training can be provided by the field experts on the spot, through the organization of study tours and fellowship training abroad or through workshops/seminars. Apart from such "traditional" training activities the request for retraining skilled personnel occurs more and more often.

It is obvious that during any restructuring and rationalization process excessive labour force is reduced to correspond to the actual requirements.

Thereby staff will be released for redeployment to other industries in a given area. Proper retraining of employees and workers is necessary and such retraining capacity (including training of trainers) needs to be established/ strengthened. A typical project is presently under implementation in the CSFR, with the aim of upgrading the Poldi Steelworks Retraining Centre at Kladno.

- ***Advice on marketing and sales of products***

Major emphasis is being placed on converting industries to become competitive in a market economy. This is particulary acute for eastern European countries in the transition stage from centrally-planned to market economies and also with a view to privatization. Centralized marketing and sales services that were provided in the past are often no longer available and the plants have to establish their own sales departments to undertake marketing research and provide customer service. Many industries must rely on exports to survive. In a number of developing countries the strategic economic capabilities are based on a few commodities, e.g. for Central America the agro-based industries or the oil industry for Iran. Their competitiveness on the international market needs to be ensured through diversification of production and introduction of new products to yield higher added-value. Apart from market analyses assistance in product design for export, packaging and service is required.

INTRODUCTION AND DEVELOPMENT OF NEW AND EMERGING TECHNOLOGIES AND HIGH TECHNOLOGY BASED INDUSTRIES

UNIDO is actively engaged in promoting and encouraging the development and transfer of technology on the basis of the least possible cost for developing countries particularly such technologies which would help to promote better terms of trade and an increased share of manufactured goods from developing countries. Developing countries need to keep abreast of global technological advancements and possible new opportunities for economic development. The raw materials necessary for new materials production are available in many developing countries and are often materials in high demand by the electronics, energy source, pollution control and consumer products industries.

In line with its mandate and in all its projects IO/T is active in promoting the selection and application of energy saving and environmentally friendly "clean" technologies (e.g. LW/NW) as well as high tech based on recent scientific achievements, such as genetic engineering, biotechnology, production of synthetic fibres, composites, new materials, advanced ceramics and special glasses. Exchange of information and experience among experts from developed and developing countries regarding the application of new materials in industry and everyday life is encouraged, e.g. through the organization of the Expert Group Meeting on Processing and Application of New Materials, held in Vienna in November 1991. Considerable progress can also be achieved through the development of very specific R and D centres to promote technological capability within developing countries, e.g. high-tech development centres in Brazil, China, Egypt, India, or a Silicon Development Centre in Pakistan.

This group of activities also embraces computer applications in industrial processes, CAD/CAM/CIM (computer-aided design, computer-aided

manufacturing, computer integrated manufacturing) and the development of electronic industries.

OTHER PRIORITY AREAS

◘ *Safety aspects*

In all aspects of industrialization, safety issues must not be neglected. This subject is of particular concern in pesticides production. Faced with an ever growing population developing countries must increase the yield per unit area to cope with the requirements for agro-based products. It is estimated that more than a third of the world's food production, apart from natural disasters, is lost due to insects, plant diseases, weeds, rodents etc. Only a few developing countries can afford to manufacture pesticide active ingredients, a large number imports these ingredients and formulates pesticides on a small scale, often using traditional formulations which causes severe operational and environmental safety hazards. UNIDO is actively promoting the introduction of integrated international safety guidelines for pesticide formulation. An Expert Group Meeting to this effect was held in Brussels, in January 1992. Also promoted is the development of pesticides based on natural products. Other issues of attention are dual technologies in chemical industries, replacement of banned toxic chemicals, safety audits, etc.

◘ *Conversion of military to civilian production*

This subject would require a review of the different military technologies used in a given country (e.g. in the former USSR) in the past to identify the scope which these technologies leave for production of other goods for the local market as well as for export. As an example, some of the technologies could be very suitable for sterilization in the food industry to ensure high quality products suitable for lenghty transportation and exportation; c equipment and processes could be used for upgrading existing production processes in different industries such as metallurgy, engineering, electronics, petroleum refining, etc. The Russian Federation has already expressed keen interest in the subject of converting military production. As a first step the UNIDO Industrial Co-operation Office in Moscow is helping some foreign enterprises to enter into business and investment relations with Soviet enterprises. UNIDO and the Association of Machine-Building Technologists co-organized the International Conference on Conversion which was held in Moscow in December 1991.

◘ *Emergency assistance*

Ad-hoc advice from IO/T is being sought when emergency measures need to be launched. This may refer to the elaboration of new specifications and techniques for establishment of housing and shelters in earthquake prone areas (e.g. regional network in the Philippines) or urgent trouble shooting assistance through short term projects in various industrial sub-sectors. Special emphasis is accorded to assist least developed and seriously affected countries.

SCOPE OF TECHNICAL ASSISTANCE PROJECTS

Whilst keeping in mind the above listed new challenges and opportunities, particularly those related to energy-saving and environmentally friendly technologies and plant rehabilitation, a major part of the ongoing project activities is still devoted to assist developing countries in improving their basic needs, i.e. nutrition systems, better processing of food, packaging, storage and distribution; improvement of housing and shelter, through production of diverse building materials, including cement, concrete, bricks and timber products and designs for low-cost housing systems; amelioration of health systems by development and production of pharmaceuticals from medicinal plants, and chemical synthesis. Innovation of clothing design by provision of assistance for the production of textiles from pure cotton or wool, mixtures with synthetic fibres, development of garment industries and design centres, which also promote better standards of design and materials. Also included are leather and leather products industries improved by better tanning and processing systems, and new product designs. CAD/CAM play an important role. The establishment and/or strengthening of foundries and mechanical workshops to produce basic agricultural tools and implements and locally needed spare parts are another area of concern.

PROJECT IMPLEMENTATION

The means and instruments available to UNIDO to fulfil its technical assistance programme consist in the provision of experts or consulting companies; procurement and supply of certain equipment items; and training and manpower development.

(a) Provision of experts. Expert/consultant advice may be provided for short periods of 2 weeks, up to a year or more (in the case of Project Managers). Per annum UNIDO has about 3.000 experts working in the field. Half of these experts hold assignments in IO/T administered projects.

(b) Training and manpower development is basic to securing continuity of industrial development by skilled personnel, proper maintenance and better management of industry in developing countries. This is achieved by means of fellowships, study tours, in-plant training, workshops and seminars.

(c) Supply of equipment is another very important issue, as it may concern equipment which is not available "on-shelf" but specially chosen for a specific technology or designed for a given industrial application appropriate to meet the plant's objectives. In a number of cases instruments and equipment need to be selected and procured for laboratories or demonstration pilot plants.

In the implementation of the technical co-operation activities the following services are provided:

- Identification and initial evaluation of project opportunities;

- Preparation and evaluation of techno-economic cost-benefit analyses, opportunity studies, pre-feasibility studies and full techno-economic studies;

- Project formulation and design;

Technical assessment and management plans at the design and formulation stage are applied and go through various stages of appraisal. Initially, technical assessment is carried out according to criteria set at the Branch level.

- Preparation of the Project Document, detailed implementation plant and project budget;

- Project implementation;

- Follow-up activities.

To complement and support its technical assistance programme the Division organizes Symposia, Expert Group Meetings, Workshops, Seminars and Group Training Programmes. It also issues various technical papers and disseminates meeting reports. The list of Documents issued by IO/T since 1 January 1987 and the list of Meetings/Workshops/Seminars/Conferences organized by IO/T since 1 January 1981 are available as separate documents.

In attempting to achieve the desired results, various programmes mentioned earlier run simultaneously and staff members play an important role in their execution. For staff members of IO/T it is a challenge to keep abreast of new and changing developments and technologies and this is reflected in the preparation of project documents. At the same time, this dynamic process creates a unique advisory base which may not easily be matched elsewhere. At any time staff members are ready to provide information to member states, governments and industry. UNIDO, through its IO/T Division, is in the forefront when considering aspects of industrial technical assistance project management, especially in areas of industrial planning, productivity, transfer of technology, manpower evaluation, global trends in marketing and financing, as well as R and D.

Furthermore in giving the required impetus to various industries, the staff with their advisory skills and special training help to counterbalance the occasional lack of technical dialogue between the suppliers in the North and the receivers in the South. as well as the lack of access to the latest technological applications. Individual staff members can provide unbiased advisory services and may perform, in big projects, as contract executors working with several contract managers, assisting in the preparation of tender documents, specifications and evaluation of tenders for establishment of industrial plants/units and procurement of equipment. They may also advise the governments on the selection of suitable contracts and companies for their consideration.

Full support is provided by the Senior Interregional Advisers, attached to the various Branches of IO/T. They travel, upon ad-hoc requests from developing countries, and provide short term advisory services on the spot and/or help in identifying the actual technical assistance requirements and in preparing project documents.

PROJECT ACTIVITIES AND PRIORITY AREAS

Timely advisory intervention has proven to be an asset in the successful implementation of technical assistance programmes. Owners of industries in developing countries, while improving their operations have also the opportunity to objectively assess their competitive positions within the industry as they are in national, international and global markets.

CO-ORDINATION OF EFFORTS

The Division co-operates with all units of UNIDO, especially with the Area Programmes of the Department for Programme and Project Development as project and pipeline development is a "joint venture" with that Division. During the implementation cycle, the Division works closely with the Project Personnel Recruitment and Administration Service, Financial Services Division and Purchase and Contracts Sections. Work is also carried out in conjunction with the Feasibility Studies Branch for projects with investment potential, and with the Investment Promotion Division of UNIDO in diverse areas of industry, as well as with the Industrial Human Resource Development Branch for upgrading skills. For integrated multi-disciplined projects, the Division co-operates closely with all units within the Department of Industrial Operations as well as calling on the expertise from other Departments.

The Division also provides inputs to different activities outside the Department such as being available for consultations; providing contributions to UNIDO's industrial and technological information bank (INTIB) as well as to global, regional, national and sectoral studies; assisting in studies of technical advances, technology acquisition, technology development and applications; participating in and contributing to meetings organized by other Divisions of UNIDO as well as to selected international meetings; carrying out promotional work relating to technology, environment and energy. Being responsible for about half of UNIDO's technical assistance delivery, IO/T also contributes to overall policy design and the future perspectives and opportunities for the organization, especially dealing with industrialization, the industrial sector and industry itself.

FUNDS

The main sources of financing UNIDO's technical assistance activities are the *funds allocated by the United Nations Development Programme* (UNDP), for which UNIDO acts as an executing agency. These funds are allocated to each developing country and region and normally programmed in cycles of five years and known as the Indicative Planning Figure (IPF). Co-financing (cost-sharing) by the recipient country is often invited and essential.

The *Special Industrial Services (SIS) fund of UNDP* is confined to an amount of maximum $ 150,000 per project and is meant to provide services which aim at solving urgent and very specific, unforeseen industrial problems of an emergency nature.

The *Industrial Development Fund (IDF)* consists of voluntary contributions from governments and non-governmental organizations (including private enterprises), in local non-convertible and convertible currencies

directly pledged to UNIDO. It was created to finance innovative, non-traditional industry-related projects of a pilot character with relevance to a large number of countries and with priority given to projects which will have a multiplier effect. Activities are restricted by the low general purpose convertible contributions, which is the only segment of the IDF that can be freely programmed.

UNIDO has taken a new initiative to include *Special Trust Fund schemes* as part of the special programmes and activities of the organization. The funds required for each project come either from the beneficiary of the UNIDO assistance in the developing country (in which case it is called *self-financed trust fund* project) or from a *third-party donor*, which may be a development finance institution, a governmental or non-governmental donor agency, an individual or a group of companies, or industrial associations. **The three major thrusts of the special trust fund programme are:**

- **direct support of manufacturing plants** in the developing countries for performance improvement, training, manpower development, maintenance and self-help programmes;

- **service to development finance institutions** in designing, formulating and implementing selected industrial projects, particularly in rehabilitation of plants, small- and medium-industry development, indigenous entrepreneurial development, training and technical cooperation among developing countries;

- **programme or project management service to donor agencies** in the design, formulation and implementation of programmes on selected priority objectives, e.g. integration of women in industrial development, enterprise-to-enterprise co-operation, procurement of goods and services, agro-industries and human resources development.

CONCLUSION

IO/T has unique capabilities and potentials in the industrial sectors described, as well as in all aspects of technology linked to industry especially in the light of the rising cost of energy and its economic impact on industrial development. Recycling of wastes and utilization of by-products is an increasingly important activity connecting environmental and economic aspects of industries and creating new possibilities for small, medium and large scale industries, especially in the private sector.

A group of knowledgeable and highly experienced technical staff in various technological operations gives the Division a flexibility and potential to respond to diverse problems arising from industrialization. As regards the specialization of professional staff in IO/T, such information can be found in **"Who's Who in the Industrial Operations Technology Division"**, a brochure which is continuously updated and issued twice a year by IO/T. In addition, the experience gained in the last 22 years in implementing some 7,000 - 8,000 projects throughout the world is another asset in implementing appropriate and meaningful projects in a competent way.

Finally the key role played by the Division is the identification of problems, the basis of which is the formulation of enterprise level projects and Trust Fund Agreements. These are for the increase of efficiency and the raising of capacity of industries. This is an essential and expanding area which challenges in-house knowledge and especially the Division's competence and expertise in solving problems of operating on an industrial scale. It is IO/T that implements most enterprise-level operations on behalf of owners, with a number of trust fund projects operational over the last ten years.

The project areas mentioned in this booklet are indicative only since it is not possible to mention all the areas covered by projects which may differ from year to year and cycle to cycle. The following chapters provide an introduction to the industrial areas covered by the various sectors, i.e. agro-based, chemical, engineering and metallurgical Industries. Detailed information on these industrial areas and the respective activities are provided in separate brochures which were issued in March 1992 and which may be obtained upon request. A summary of the new priority areas that IO/T is confronted with is provided in the booklet **"NEW CHALLENGES AND OPPORTUNITIES"**.

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Industrial Operations Technology Division

AGRO-BASED INDUSTRIES

The Agro-based Industries Branch concentrates mainly on better valorization of the existing structures in developing countries and on the improvement of the quality of products that conforms to the norms and qualifications required by the demands of the international market. Special emphasis is laid on transferring technology and exchanging managerial and marketing experience, with a view to reducing to a minimum the dependency of industry on imports; introducing high technologies in large scale centralized production plants and towards the technical and economic improvement of small and medium scale production units. The main sub-sectors covered by the units of the Agro-based Industries Branch are:

- Agro-based food processing;
- Animal-based food processing;
- Textile and garment industries;
- Leather and leather products;
- Wood processing and wood products industries.

Common topics of the agro-based industries concerning improvement of the quality, environment protection and energy conservation are also actively pursued by the Agro-based Industries Branch, with high priority accorded to:

- industrial effluent treatment;
- development of cleaner technologies;
- processing of industrial wastes (aimed at valorization or elimination);
- utilization of by-products.

The Branch also provides supporting activities towards marketing of agro- and animal-based products, including standardization, products and packaging quality control, storage of agriculture or animal sources raw materials or processed commodities, transportation, distribution, etc.

The economic and political needs for the development of small-scale rural activities are recognized as important factors in private industry development in developing countries. Special efforts are being made for the integration of women in the industrial production process.

For further information please consult the paper

AGRO-BASED INDUSTRIES

which covers the following sub-sectors

- ***ANIMAL-BASED FOOD PROCESSING***
  - Dairy industry;
  - Meat industry;
  - Fish industry;
  - Poultry industry;
  - Baby food industry;
  - Animal feed industry.

◘ *AGRO-BASED FOOD PROCESSING*

- o Fruits, vegetables and derivatives;
- o Cereals, tubers and derivatives;
- o Nuts and derivatives;
- o Sugar and sweeteners;
- o Fats and oils;
- o Animal and vegetable proteins;
- o Enzymes, flavours and natural colours;
- o Cocoa, tea and stimulants;
- o Hydrocolloids;
- o Spices and derivatives;
- o Drinking water;
- o Alcoholic and soft drinks;
- o Aquaculture.

◘ *LEATHER AND LEATHER PRODUCTS INDUSTRIES*

- o Hides and skins improvement;
- o Leather processing;
- o Design, product development, pattern engineering;
- o Manufacturing technology of footwear and other leather products;
- o Development of support industries;
- o Environmental protection;
- o Natural rubber processing (special area).

◘ *TEXTILE AND GARMENT INDUSTRIES*

- o Spinning, weaving, knitting and wet-processing;
- o Assessment and utilization of unconventional indigenous fibres;
- o Assessment of textile and garment technologies;
- o Computerized productivity and quality systems;
- o Waste reduction;
- o Quality assurance and control.

◘ *WOOD PRODUCTS AND WOOD PROCESSING*

- o Production of furniture and joinery;
- o Use of wood in construction (housing, bridges, etc.);
- o Production of miscellaneous wood products (consumer items, boat building, packaging);
- o Research and development on wood technology;
- o Maintenance of wood processing plants, machinery and tools;
- o Waste utilization, such as production of panels from agricultural residues.

CHEMICAL INDUSTRIES

Chemicals are essential to virtually all industries and to agriculture even though the chemical industry is often mistakenly associated with capital-intensive petrochemical complexes and the use of potentially dangerous and environmentally hostile processes and thus considerably unsuited for developing countries. However, chemicals are needed for pharmaceuticals and medicines, housing and shelter, textiles and clothing, food production and food conservation, printing and communications. They are just as essential for developing as well as industrialized countries. Chemical products, such as soaps and disinfectants also play a role in improving public hygiene and thus in increasing life expectancy.

The industrial activities covered by the Chemical Industries Branch are exceptionally wide and varied and include:

- the treatment and transformation of basic raw materials such as crude oil, natural gas, coal, wood, vegetable products from the point were they are either available at the well head or mine, harvested or extracted for the production of bulk commodities such as gasoline, fertilizers, building materials, paper, cement, fuel oil, acids, alkalis and chemicals used by the chemical industry itself as well as by other industries;

- the production of basic petrochemical intermediates, which are used to make plastics, fibres, paints, dyes, solvents, detergents as well as the production itself of these latter products;

- the transformation of plastics into end and consumer products;

- the manufacture of small volume, high value performance products, such as pharmaceuticals, speciality chemicals, natural medicines, perfumes and fragrances.

Not having a chemical industry can severely handicap a country's industrial development. It will have to pay a much higher price for the chemicals it needs than does a country with an efficient chemical industry. The cost of imported basic chemicals such as acids, alkalis, chlorine for water purification, fertilizers, solvents for paint manufacture, formaldehyde for resin manufacture, lubricating oils and insulating materials is often far higher than the cost of making the product in its country of origin and may be twice as high as in industrialized countries. This can put an insurmountable hurdle in the way of the development of quite simple industries which, with low labour costs, could be otherwise quite profitable.

In order to promote the development of the chemical industries the Branch gives assistance on all aspects of planning and provides advice on a country's economic growth. These objectives are sought through working in partnership with those countries requiring to set up a chemical industry or to modernize the existing industry. With an average annual implementation figure of over US$ 30 million the Branch holds the leading position within UNIDO in regard to technical assistance programmes.

For further information please consult the paper

CHEMICAL INDUSTRIES

which covers the following sub-sectors

- ***BIOTECHNOLOGY***
  - Production of chemicals and biochemicals;
  - Production of microbial pesticides;
  - Energy - production of fuels from renewable biomass sources using microorganisms;
  - Composting of the organic fraction of municipal wastes;
  - Biochemical engineering;
  - Industrial waste water treatment.

◘ *BIOMASS AND ENERGY*

- o Introduction and development of biomass energy systems for local heat and power supply;
- o Development of alternative sources for charcoal production to release the current pressure on the environment;
- o Development of environmentally sound coal conversion processes.

◘ *CEMENT AND LIME INDUSTRIES*

- o Clean and environmentally-friendly operation of cement plants;
- o Use of fillers and extenders (pozzolanic materials)
- o Technical assistance related to quarrying, crushing, blending, grinding, homogenization, preheating and calcination, clinkerization, cooling, milling and packing.

◘ *FERTILIZERS AND PESTICIDES*

- o Mineral fertilizers production (macro-nutrients);
- o Nitrogen;
- o Phosphate;
- o Potassium;
- o Organic fertilizers;
- o Organic/mineral fertilizer mixtures;
- o Micro-nutrients;
- o Pesticides, insecticides, fungicides, herbicides, rodenticides, bio/botanical pesticides, plant growth regulators;
- o Effluent control/waste management.

◘ *NON-METALLIC MINERAL BASED INDUSTRIES*

- o Ceramics and clay based technologies;
- o Glass technology;
- o Building materials and construction industry;
- o Stone and stone products;
- o Handicrafts and decorative items;
- o Industrial minerals and their application.

◘ *PETROLEUM REFINING AND PETROCHEMICALS*

- o Petroleum refining;
- o Lubricating oil production, distribution, use and recycling;
- o Natural and associated gas treatment and use;
- o Production of petrochemical intermediates, polymers and resins;
- o Synthetic and natural rubbers;
- o Products made using petrochemicals;
- o Recycling.

◘ *PHARMACEUTICAL INDUSTRIES*

- o Utilization of medicinal and aromatic plants;
- o Biologicals;
- o Basic manufacture - multipurpose pilot plants;
- o Formulation and packaging;
- o Control of diarrhoeal diseases;
- o Products from slaughter house residues;
- o Biotechnology;
- o Family planning devices;
- o Quality assurance and good manufacturing practice;
- o Reagent chemicals and reference substances;
- o Pharmaceutical necessities.

◘ *PULP AND PAPER*

- o Fibrous raw material collection and preparation;
- o Pulping and pulp bleaching;
- o Black liquor chemical recovery and lignin utilization;
- o Papermaking (different grades of paper and board);
- o Handmade papermaking;
- o Chemical additives for pulping and papermaking;
- o Waste paper utilization;
- o Pollution control and abatement.

ENGINEERING INDUSTRIES

The development and strengthening of national engineering capabilities is an area of priority in any national development plan as modern engineering should be the basis for any industrial and economic development, not just for engineering but for all industries including sub-sector product maintenance/ services. Engineering industries range from the supply of equipment to technologically advanced engineering production in small- and medium-scale industries. The Branch is responsible for activities in the fields of

- Agricultural machinery and implements;
- Electronic equipment and computer applications;
- Energy systems engineering and application;
- Metalworking and machine tools;
- Transport systems engineering and application.

The main areas of technical co-operation are the application of appropriate techniques to rural industrialization; integration of electro-mechanical and electronic aspects in sub-sectoral development; development of equipment in the energy sector; advancement of value-added manufacturing through process technology and packaging techniques; repair and maintenance; and the introduction and application of advanced technologies. Lately, activities have focused on rural development through agricultural mechanization, technological structures for the metalworking sector, equipment for the energy sector, spare parts manufacture, and rehabilitation and maintenance of existing equipment. Activities also cover computer and computer-related equipment, measuring and control equipment, and energy-related equipment.

The overall priority area themes of the UNIDO and the Branch's programme are the development and transfer of technology, promotion of small and medium scale industries, human resource development and training, promotion of safe and healthy environment, encouragement of co-operation among developing countries, promotion of integration of women in industrial activities, and promotion and consideration of energy aspects.

For further information
please consult the paper

ENGINEERING INDUSTRIES

which covers the
following sub-sectors

- ***AGRICULTURAL MACHINERY***

  - Agricultural machinery and equipment;
  - Agricultural implements;
  - Process control and automation equipment and systems;
  - Mechanical components.

◘ *ELECTRONIC EQUIPMENT AND COMPUTER APPLICATIONS*

- o Electronic components and equipment;
- o Medical equipment;
- o Environmental monitoring and control equipment;
- o Telecommunications equipment;
- o Industrial process control and automation systems;
- o Precision mechanical components.

◘ *ENERGY SYSTEMS ENGINEERING AND APPLICATIONS*

- o Conventional sources of energy;
- o New and renewable sources of energy (wind energy, hydropower, solar energy, biomass and biogas engines);
- o Energy auditing and conservation.

◘ *METALWORKING AND MACHINE TOOLS*

- o Metalworking industry;
- o Machine tool industry;
- o Tool, die design and manufacture;
- o Repair and maintenance.

◘ *TRANSPORTATION SYSTEMS ENGINEERING AND APPLICATIONS*

- o Land-transport equipment (railways and road);
- o Water-borne transport equipment (sea and river);

METALLURGICAL INDUSTRIES

The mandate of the Metallurgical Industries Branch is the acceleration of exploitation and processing of local ore and metal resources of developing countries to yield added value metallic and other products for home use and export.

Depending upon the complexity of the technical co-operation project costs may vary from several thousand to several million dollars. More than 100 technical assistance projects are under implementation at the same time; about the same number of projects are under formulation/preparation. The main subjects covered by the projects are as follows:

Development and strengthening of the non-ferrous metals industry;

Development and strengthening of iron and steel industries;

Development and strengthening of foundry and other metals forming/ transformation industries and products;

Establishment and strengthening of centres/laboratories or of testing/ evaluation units for metallurgical technology and corrosion protection;

Industrial processes for utilization/recycling of metallurgical wastes, promotion of environmental and pollution control measures and processing of metallurgical scrap to produce added value products;

Introduction of rationalization and computerized systems in production processes, maintenance and related fields;

Development of new advanced metals, alloys and composite materials.

Within these technical areas the Metallurgical Industries Branch is primarily concerned with the following activities:

(a) Elaboration and adaptation of technologies for processing of metallic minerals or ores including assessment of data on volume and quality of reserves;

(b) Assistance in establishment, management and operation of new plants at all levels, including national planning of metallurgical industry sectors.

(c) Provision of expertise for rehabilitation, modernization and efficient operation of existing plants covering application of appropriate technologies and equipment;

(d) Assistance in restructuring, privatization and conversion of metallurgical industries on company and plant level;

(e) Advisory services related to environment protection, energy management and conservation;

(f) Advisory services in standardization of metal products;

For further information please consult the paper

METALLURGICAL INDUSTRIES

which covers the following sub-sectors

◘ ***NON-FERROUS AND PRECIOUS METALS EXTRACTION***

- Restructuring and rehabilitation of non-ferrous metallurgical industries;
- Small and medium mineral processing companies;
- Electroplating industry;
- Evaluation of ilmenite deposits and TiO_2 containing raw materials regarding their utilization and suitability for pigment production;
- Upgrading the level of welding technology;
- Identification of investment opportunities for new products in the aluminium downstream industries.
- Low-waste/non-waste, recycling and clean technologies;
- Computer systems for process control and energy conservation.

◘ *IRON AND STEEL AND NEW MATERIALS/ PROCESSES*

- o Development and application of new technologies and advanced steel products;
- o Energy conservation, environmental monitoring, provision of environmentally sound steel technologies and utilization of industrial wastes;
- o Introduction of rational computerized systems in production processes, maintenance and related fields of metallurgical industry.

◘ *FOUNDRY, METAL TRANSFORMATION AND PROCESSING*

- o Foundry o Forge (manufacture of quality cast and forged parts, design, prototyping and reverse engineering of metal parts, application of CAD/CAM);
- o Heat treatment;
- o Steel rolling;
- o Welding;
- o Surface treatment;
- o Electroplating;
- o Hard facing;
- o Coatings;
- o Metal forming;
- o Powder metallurgy.

◘ *COMPUTERIZED MAINTENANCE MANAGEMENT IN METALLURGICAL INDUSTRIES*

- o Introduction of CMMS, computer based production and computer based process control;
- o Computerized energy conservation;
- o Software development and training centres;
- o Establishment of Total Quality Management programmes;
- o Introduction of computer automation;
- o Plant condition monitoring;
- o Application of expert systems.