OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

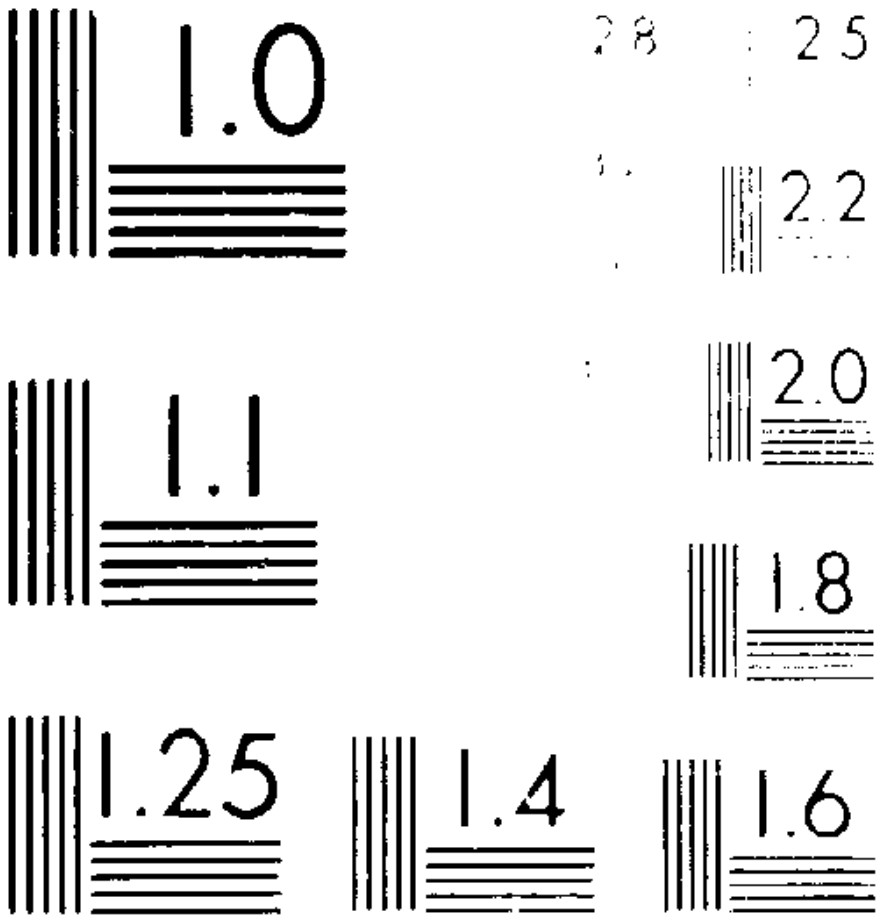
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org


1.0
2.8
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

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.

Metallurgical industries

Because of their importance to industrialization, metallurgical industries play a key role in the UNIDO programme of technical assistance to developing countries. They cover the following areas of extractive and physical metallurgy:

Processing and fabrication of light and heavy non-ferrous metals

Iron and steel industry

Foundries and other metal-transformation processes

Transfer of metallurgical know-how and technology

Processing of metallurgical minerals

Within these areas the technical assistance activities of UNIDO primarily cover the following functions:

Planning, establishment and operation of new metallurgical plants and foundries, including national planning of major metallurgical and foundry sectors (master plans, techno-economic and marketing studies)

Technical evaluation and laboratory testing of metallurgical raw materials, semi-finished and finished products

Provision of expertise for the efficient operation of existing plants, and study, selection and application of appropriate technologies and equipment

Design, programming and modernization of existing metallurgical plants

Provision of advisory services on standardization of metal products

Establishment of computerized maintenance systems in metallurgical plants

Establishment and strengthening of centres or laboratories or testing units for metallurgical research and development, including adaptation of technology suitable for local conditions

Establishment of pilot and demonstration metallurgical plants, foundry and forge plants and technology centres

Provision of specialized training

In addition, UNIDO organizes symposia, seminars, workshops and expert group meetings on metallurgical subjects. It prepares special studies and documents and distributes them to developing countries.

UNIDO places emphasis on providing technical assistance to the least developed countries. A number of projects, particularly those whose goal is to increase the output and improve the quality of urgently needed cast

spare parts, tools and implements in the foundry sector, are under implementation in such countries.

The objective of this UNIDO programme is to accelerate the exploitation and processing of ores in developing countries to yield products with added value for home use and export.

Over the last 10 years, UNIDO has implemented 235 technical assistance projects in metallurgical industries, organized 20 international meetings in this area, and prepared some 38 studies on metallurgical topics for dissemination to developing countries.

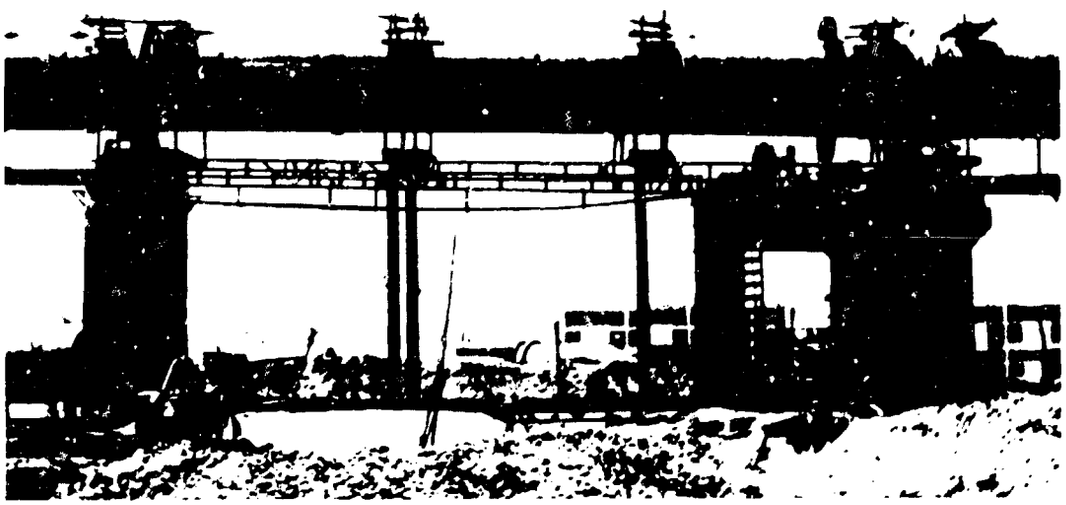
Examples of UNIDO technical assistance are given below.

UNIDO TECHNICAL ASSISTANCE

Demonstration plant for the production of sponge iron, Andhra Pradesh, India

Despite India's lack of extensive natural gas resources, it has abundant reserves of non-coking coal to sustain a sponge-iron industry. This was a primary consideration when UNIDO, which had pioneered the use of non-coking coals to reduce highly metallized sponge iron for direct electric-arc steelmaking, agreed to assist in setting up a plant in Kothagudem (State of Andhra Pradesh) as a demonstration unit.

This plant is an example of the application of direct reduction technology to produce steel by making sponge-iron pellets, using no oil, gas or metallurgical grade of coking coal; only non-coking coals provide the basic source of thermal energy and act as reductant. The process bypasses blast furnaces, coke ovens etc., thereby greatly reducing the capital costs of steel production. The demonstration plant has an output of over 100 tons per day of highly metallized sponge iron. It also operates a well-equipped and well-staffed laboratory with facilities for testing the physical and

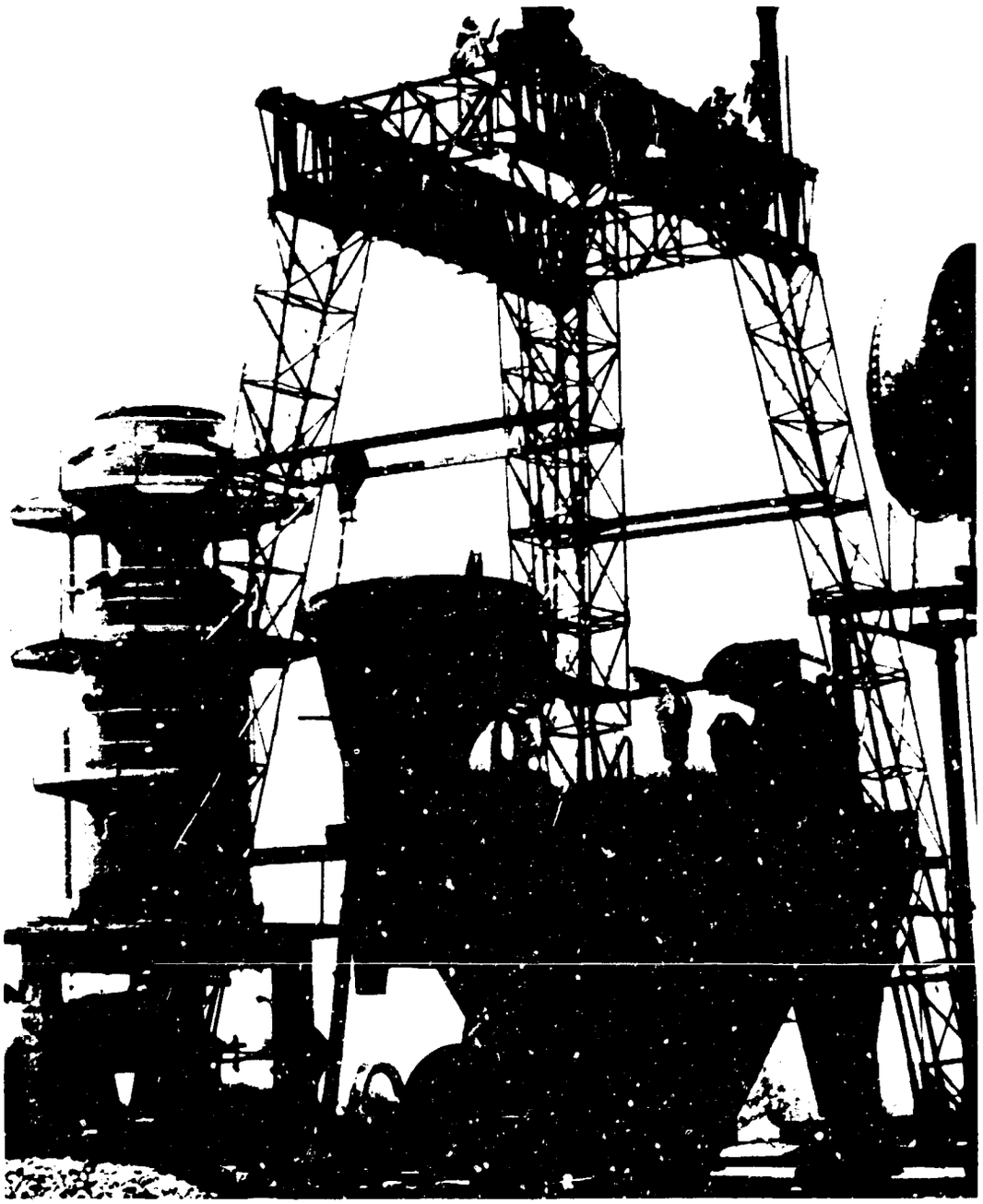


Rotary kiln under construction at the demonstration plant for the production of sponge iron, Andhra Pradesh, India

metallurgical characteristics of various raw materials, such as iron ore and coal and the sponge produced at the demonstration plant and at the laboratory bench-scale kiln. In addition, the laboratory's specialists provide consulting services on the complex technology of sponge production and on the design and operation of mini steel plants.

Training figures prominently at the Kothagudem plant. Instruction is given in the operation, maintenance and process control of sponge-iron plants. Trainees come from other countries as well as from all parts of India.

The plant was inaugurated on 31 December 1980. If its hitherto successful operations continue, it can significantly contribute to raising steel



Installation of after-burner and stack of the rotary kiln for the demonstration sponge-iron plant, Andhra Pradesh, India

production in mini steel plants in India. Scores of such plants in the country will be the major beneficiaries of this UNIDO-Indian venture. It is now leading to commercial-size sponge plants in India, thereby increasing the supply of sponge iron available to the mini steel plants.

This project was one of the largest of its kind in the United Nations system. It cost around $US 25 million, of which $US 5 million came from the United Nations Development Programme and the balance from the Government of India on a cost-sharing basis.

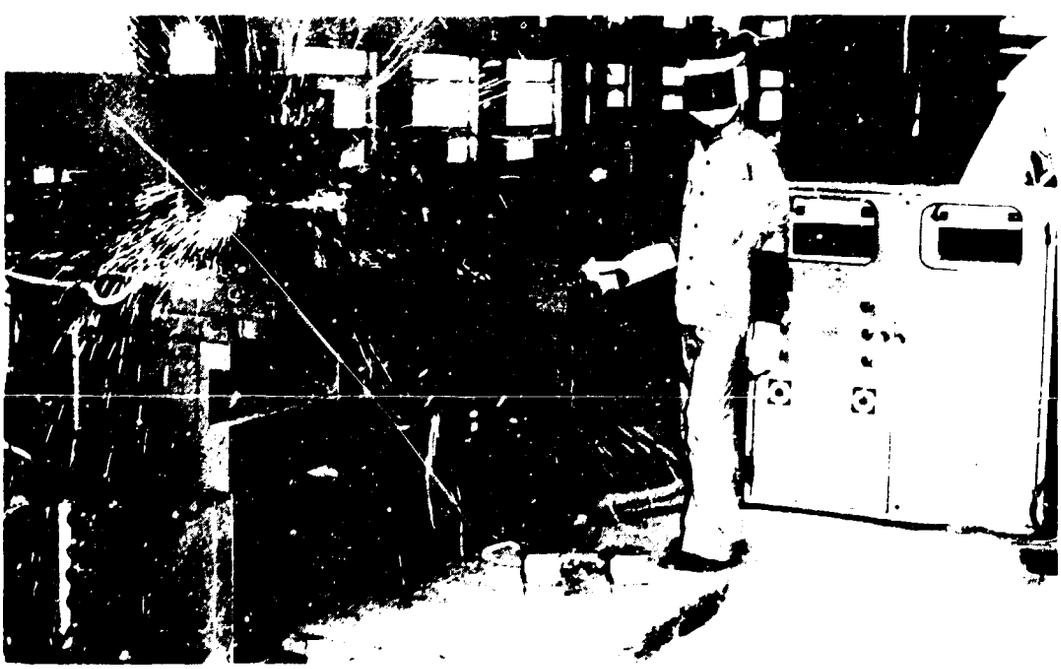
Welding Research Institute, Tiruchirapalli, India

UNIDO, acting as executing agency for the United Nations Development Programme, assisted in the establishment of the Welding Research Institute at Tiruchirapalli, India. It provided expertise and research equipment and sent trainees abroad. The Institute has rapidly developed into a national research centre, with a laboratory and an engineering wing for design, development, documentation and consultancy. Specifically, it:

(a) Carries on research and development in welding processes and technology, including special prototype welding, weldability studies and metallurgical investigations;

(b) Organizes regular training courses for engineers, supervisors and welders – more than 40 organizations and over 500 individuals from industries in India and abroad have so far benefited from the Institute's training programmes;

(c) Maintains a computer bank – documentation services have been extended to more than 30 industries;



Flash butt welding of tubes in progress at Welding Research Institute, Tiruchirapalli, India

(d) issues technical information and publications – a number of keyword bulletins and technical bulletins have been published and circulated to over 500 industries and individuals all over the country.

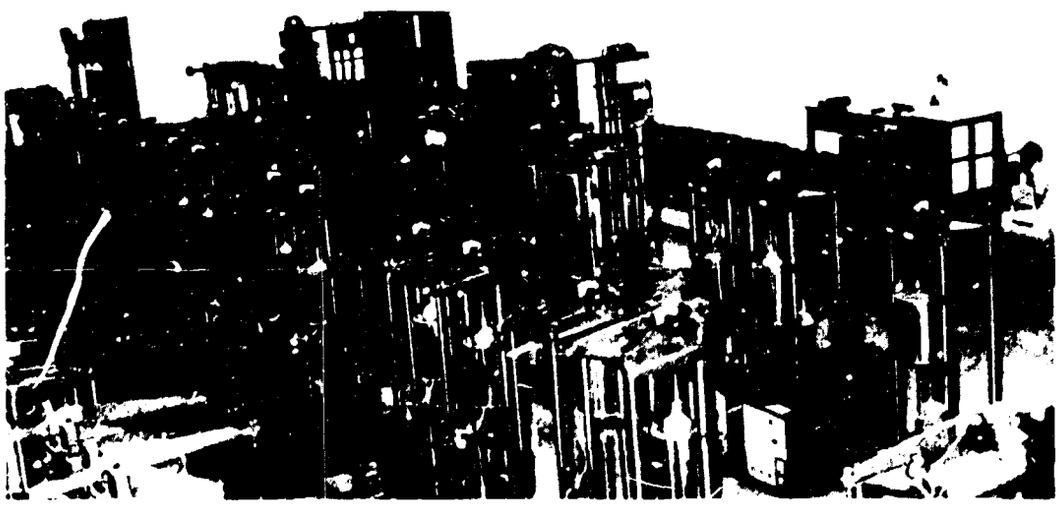
The idea of setting up this project on a regional basis is being considered, in order to extend the services to other developing countries.

Central high-temperature creep-testing laboratory, Jamshedpur, India

A central high-temperature creep-testing laboratory has been set up, with UNIDO assistance, at the National Metallurgical Laboratory, Jamshedpur, India. One of the most modern laboratories of its type in the world, it has facilities for testing high-temperature, long-term creep, creep rupture and stress relaxation extending to over 20,000 continuous hours of test work to provide 100,000 hours of design data on high-temperature creep-resistant alloys under development in India. The laboratory also serves as a centre for development of advanced high-temperature alloys based on Indian alloying elements. United Nations technical assistance to this large-scale project was about $US 800,000, with a well-matched government contribution for a new laboratory building.

Fully air-conditioned and furnished with a stand-by diesel electric generator, the laboratory is now in full operation and is meeting the country's requirements for high-temperature turbines, aircraft alloys and high-temperature, high-pressure vessels. With its floating-raft foundation, isolated from the walls and main columns, the building is especially suitable for operating highly sensitive testing equipment vibration-free.

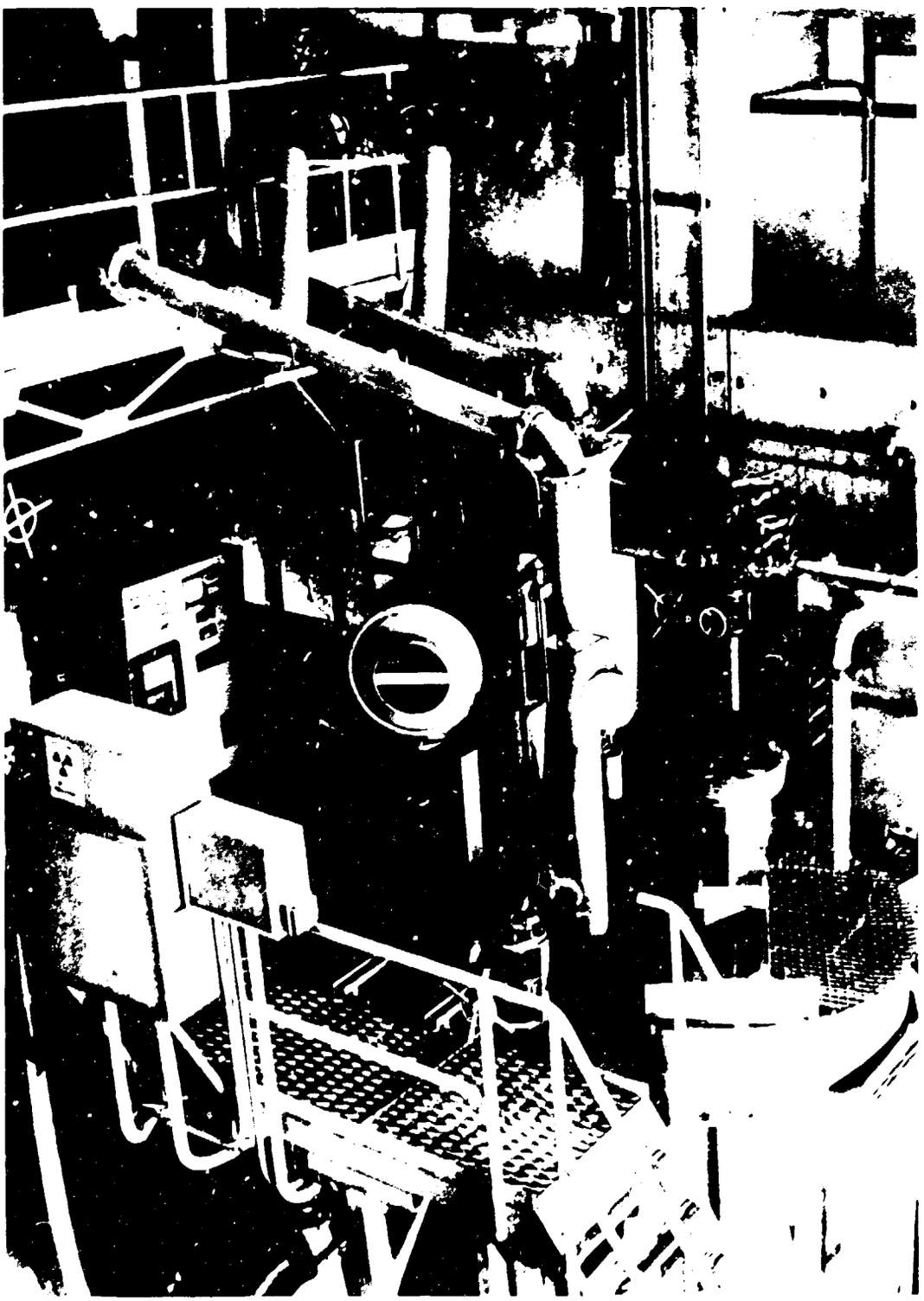
The laboratory can accommodate 400 creep-testing machines. It is equipped with over 150, among which are 12 single-specimen, high-sensitivity creep-testing machines of 5,000 kg capacity and 55 of 3,000 kg capacity, all of which can be operated at temperatures of up to 1,000° C. A 25,000 kg, high-temperature tensile-strength machine and a computerized data logger are also in operation.



General view from the mezzanine floor of the creep-testing laboratory showing several single-specimen machines in use, National Metallurgical Laboratory, Jamshedpur, India

Steel plant, Chimbote, Peru

UNIDO has been executing a technical assistance project to achieve full-capacity operation and phased expansion of the Siderperu steel plant at Chimbote, Peru. The work programme of the project comprises integrated steel-plant operations, a computerized data logging and maintenance



Pilot plant, Mineral and Metallurgical Research Centre, Santiago, Chile

system for an integrated steel plant, upgrading of steel rolling mill operations, oxygen steelmaking, and a specialized training programme for technical personnel. It has resulted in higher productivity, lower production costs and a steel output conforming to rigid quality standards. The Chimbote steel plant of Siderperu is now being expanded to double its capacity.

Mineral and Metallurgical Research Centre, Santiago, Chile

The recovery of copper from the oxidized material in most Chilean mines presents a challenge. Although recoveries of sulphides commonly run beyond 90 per cent, the intractability at present technology levels of a portion of the oxides brings recovery from oxides down to 80-85 per cent.

With the stimulus of funds from the Corporación del Cobre (CODELCO) and a United Nations commitment of about $US 3 million, an active programme of investigation has begun at the Centro de Investigaciones Minero-Metalúrgicas (CIMM), a research centre at Santiago, Chile. The centre, which deals with all aspects of exploration, mining, milling and smelting, is organized in three divisions – mining, beneficiation and material characterization, the last covering almost all branches of mineral assay and identification.

The centre is housed in two major structures. One three-storey structure is a pilot plant covering all aspects of mining, milling and metallurgy, from primary crushing through refining to casting. The facilities include a completely separate crusher with a capacity of 3-4 tons per day, communicating with the main building by bucket elevator and conveyor belts; grinding and flotation units of 250 kg/h capacity; and the unit's own tailings dump, a model for pollution-free operation of such an area.

The other building houses the offices, stores and most of the laboratory facilities. There are also separate laboratories attached to the pilot plant.

Development of the iron and steel industry, Karabük, Turkey – blast-furnace expert

The task given to one UNIDO expert in Turkey was modernization of the blast-furnace operations of the Karabük steel mills, including the establishment of a maintenance system. During three missions in 1978, 1980 and 1981, the expert co-operated with counterpart government staff in relining two of the blast furnaces so that they can now be considered modern furnaces.

Considerable savings can thus be made by engaging a single expert for work, carried out solely with locally available technologies and structural components, that normally calls for supervision by an engineering company.

Managed maintenance in metallurgical industries, Helwan, Egypt

UNIDO assisted the Egyptian General Organization for Metallurgical Industries in carrying out a pilot project for the Egyptian Iron and Steel Company at Helwan. The purpose was to train engineers in introducing and applying modern systems of managed maintenance, including coding, indexing, reproduction, storage and selection of the technical data required for an efficient functioning of the maintenance system.

As a result, a group of about 80 engineers and systems personnel has been created that will form a core of personnel competent to implement any future large-scale integrated systems for maintenance, planning and management in other industries in Egypt.

The introduction and operation of the preventive maintenance and planned repairs system enabled the Egyptian Iron and Steel Company to increase its production by 15 per cent and to make a profit for the first time in its history.

As a result, the company has received a number of requests for help in implementing integrated maintenance planning and control systems in other industries in Egypt and in training staff for this purpose. The Egyptian Iron and Steel Company has already signed contracts to assist six major industrial establishments in Egypt in implementing similar systems. Assistance to a Somali foundry is also provided.

It is relevant to mention here that the World Bank has recently laid down in its guidelines that to qualify for loans, industry must have a good maintenance planning and control system.

Technical assistance to the Companhia Industrial de Fundiçao e Laminagem, Maputo, Mozambique

The mini steel plant of the Companhia Industrial de Fundiçao e Laminagem (CIFEL) at Maputo in Mozambique was operating at about 10-20 per cent of its rated capacity, and some of its major equipment had been lying unused for years. In 1980, the Government requested UNIDO to provide expertise so that the operations of the mini steel plant could be made more efficient and the plant's idle equipment could be restarted. In particular, expertise was requested for:

(a) Side-blown converter operations to produce steel from molten pig iron, a technology chiefly used in China and India;

(b) Bottom pouring of pencil steel billets, a technology widely practised in mini steel plants all over the world but not yet introduced in Mozambique;

(c) Steel foundry operations.

Under UNIDO guidance, three experts, two of whom came from India, were sent to Mozambique to give advice on the application of the necessary technology.

As a result of the assistance of these experts, the first steel billets were produced in Mozambique in July 1981. The plant is thus now able to pro-

duce a large quantity of billets that substitute for those normally imported which means an important saving in scarce foreign currency. At the same time, the plant's success is an impressive example of technical co-operation among developing countries (TCDC).

Central Metallurgical Research and Development Institute, Cairo, Egypt

The Central Metallurgical Research and Development Institute (CMRDI) which was established with United Nations technical assistance of about $US 2.5 million over the period 1972-1980, has assisted the metallurgical industries in Egypt in achieving very good results.

Among other things, CMRDI provides specialized contractual technical services in the manufacture of high-tensile steel wire rope for heavy-duty engineering applications, such as for heavy-duty cranes, the mining industry, haulage equipment and the iron and steel industry. Research contracts thus carried out have already reached a value of $US 1 million.

The Institute has devoted particular attention to the foundry industry, as a result of which the industry now produces better castings at lower cost.

Technical expertise at the Helwan steel plant and other steel rolling mills, such as the Delta Mill at Alexandria, has shown how the number of necessary rolling passes for the same section and profile could be reduced. As a result, the volume of production of rolled steel items has been increased.

Not only is CMRDI rendering testing and trouble-shooting services to local industries, it also offers training in corrosion prevention, surface protection, heat treatment, foundry operations etc., including the organization of courses in companies. More than 300 engineers were trained during 1979/80.

Standardization, quality control and quality certification of iron and steel, Brazil

In Brazil, the most comprehensive and ambitious UNIDO project on standardization, quality control and quality certification in the iron and steel sector has paid rich dividends in the short period of four years. The development and implementation of just five standards in one steel plant has led to annual savings of about $US 2 million; in the same steel plant, the stock was reduced from 106,000 to 60,000 items within two years. This is just one typical example.

The first national plan for development of science and technology, drawn up in 1973, placed emphasis on standardization and industrial quality. As a result, the National Council of Metrology, Standardization and Industrial Quality (CONMETRO) and the National Institute of Metrology, Standardization and Industrial Quality (INMETRO) were created in December 1973.

Since iron and steel are essential basic raw materials for the extensive development envisaged in the plan, priority was given to expan-

sion of steel production and to initiation of a comprehensive programme of standardization, quality control and quality certification. This resulted in a $US 2 million UNIDO project, the objective of which was to strengthen INMETRO.

Apart from generating awareness of the importance of standards and quality, the project resulted in a reorganization of national standardization activities and improvement of related procedures. Existing standards were updated; and priority standards for iron and steel and related areas, such as refractories, welding, codes of practice for design of steel structures and steel plant equipment were formulated.

Training of personnel, considered one of the important tasks, covered top management, senior supervisors and technicians. Fifty engineers and scientists were trained to work on national standards; about 60 professors of technical universities were trained to teach standardization; and over 600 engineers, scientists and technicians were trained to work on standardization in enterprises. Twenty-one persons from Government and industry took advantage of UNIDO fellowship training programmes abroad.

Another highly successful activity was the establishment of standards in many steel plants and steel-based industries. This included training of personnel; organization of meetings and procedures; and the development, implementation and auditing of company standards.

A central documentation centre for metrology, standardization and industrial quality has been established.

The final phases of the project include the development of fire safety building codes, rationalization of steels and training in and implementation of quality control and certification in the industries.

The success of this iron and steel standardization project has resulted in an expansion of standardization to other areas. In addition, the Brazilian Government has introduced standardization as a subject of study in all technical education institutions.

Zheng Zou Light Metal Research Institute, Zheng Zou, China

While China has abundant bauxite resources, the development of aluminium production is affected by the varying chemical composition and mineralogical properties of the bauxite in different regions of the country. To speed up the development of the aluminium industry, the Government decided to upgrade its capability for bauxite research and development and requested UNDP/UNIDO assistance.

A $US 500,000 project was subsequently approved, the goal of which was to modernize the Zheng Zou Light Metals Research Institute (ZLMRI) and make it more efficient.

Laboratory equipment was supplied, including an electron microscope, a differential thermal analyser, an infra-red absorption spectrometer, an X-ray diffractometer and a particle-size distribution analyser. Chinese nationals were trained in Europe to use these instruments, and

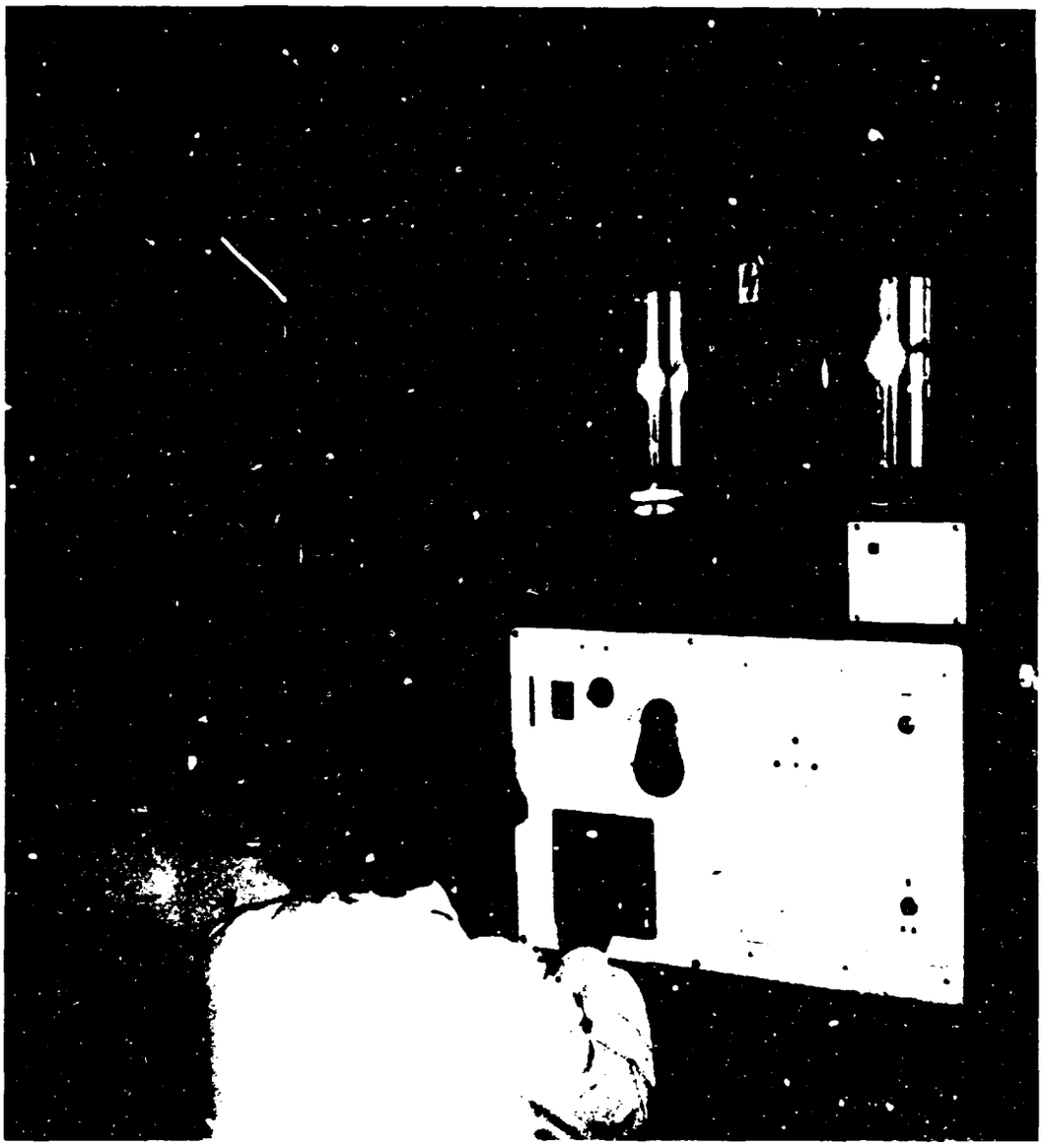
Scanning electron microscope at the Zheng Zou Light Metal Research Institute, Zheng Zou, China

thereby the Institute's capability to carry out mineralogical and technological investigations of bauxite was considerably strengthened.

The Government has indicated that it would welcome further UNIDO services to promote the country's aluminium industry. UNIDO is consequently providing follow-up assistance with a view to reducing energy consumption in aluminium and alumina production and improving research and technology.

Assistance in establishing an aluminium industry in Mozambique

UNIDO provided assistance to the Government of Mozambique in establishing a large aluminium smelter relying on the huge and only par-



Operation of differential thermal analyser at the Zheng Zou Light Metal Research Institute, Zheng Zou, China

tially tapped hydroelectric potential of Mozambique's 2,400 MW Cabora Bassa power station. UNIDO assisted in evaluating feasibility studies and in preparing reports on the supply of auxiliary raw materials and on further processing of aluminium for the region. It also helped to promote bilateral co-operation to ensure the supply of alumina to the smelter and to identify long-term markets for the aluminium to be produced.

In keeping with one of the most progressive ideas of UNIDO technical assistance – technical co-operation among developing countries (TCDC) – UNIDO identified a possible partner for long-term co-operation, namely, India, which has significant bauxite deposits. Accordingly, consultations with the relevant Mozambican and Indian authorities were initiated, and government delegations met to discuss collaboration in setting up an aluminium smelter in Mozambique.

This case is mentioned as an example of UNIDO efforts, through TCDC, to initiate and implement a $US 500 million investment project whose goal is to use the complementary resources of two developing countries to produce alumina needed by both countries. It is one of the most ambitious industrial projects emerging in one of the poorest African countries.

Establishment of Metals Advisory Services, Lahore, Pakistan

Although the metal industry in Pakistan was increasing its output, the quality of the output was below standard, and the production costs were excessive. To remedy the situation, the Government requested UNDP/UNIDO assistance in establishing advisory services for the industry.

The first phase of the project started in 1975, when the Government purchased three acres of land in Lahore. The project was run by one high-level chief technical adviser and numerous consultants, experts and subcontractors. Equipment worth $US 670,000 was procured.

Besides demonstration units, the project now has six complete specialized testing laboratories. Shop-floor demonstrations are conducted when various technologies are introduced. These have included the production of semi-killed steel, spring steel, SG (semi-grey) iron, I-beams, steel rolls and chilled cast-iron rolls.

When UNDP/UNIDO assistance was terminated in 1981, the Metals Advisory Services had already provided valuable services to industry, including some 500 technical R and D jobs requested from over 75 enterprises and organizations; paid over 300 advisory visits to local metallurgical plants; and conducted a number of specialized seminars, which were well attended. A documentation division now issues two quarterlies: *MAS Newsletter* and *MAS Bulletin of Abstracts*, which are distributed among industrialists and interested parties on a subscription basis.

The Metals Advisory Services is now in a position to assist other developing countries that may need its support, particularly in developing a foundry industry.

Application of computerized maintenance systems used in the Czechoslovak iron and steel industry

Following the successful introduction of a managed maintenance system in an iron and steel plant at Košice, Czechoslovakia, the Czechoslovak authorities agreed to transfer the acquired know-how in the development and application of modern maintenance management systems to managers, planners and engineers, and computer specialists from developing countries. A follow-up technical assistance project aimed at establishing a consulting and training centre is now being implemented. As a first step, UNIDO organized a three-week in-plant group training programme in May-June 1982 in co-operation with the Institute for Automation and Industrial Management (INORGA). Theoretical training was

given at Karlovy Vary, followed by in-plant training at the Košice plant. Twenty-one participants came from 11 developing countries. It was agreed that the course should be repeated, possibly annually.

Upgrading the scientific and technological capabilities of the Jamaica Bauxite Institute

A $US 4 million project for upgrading the scientific and technological capabilities of the Jamaica Bauxite Institute (JBI) has been initiated by the Metallurgical Industries Section of UNIDO. The project, whose goal is to improve the country's scientific capability, primarily in bauxite research, is financed jointly by the United Nations financing system for science and technology for development and by the Government of Jamaica.

The project has four aspects: designing and building a laboratory and pilot plant for tests on bauxite, alumina and related materials; training scientists, engineers and technicians for the facilities; procuring and installing new equipment; and commissioning the laboratory and pilot plant.

Since the start of the project in mid-1981, the new facilities, including the pilot plant, have been designed by JBI personnel in collaboration with UNIDO consultants. Construction of the laboratory building is complete, and the equipment, which includes an electron microscope, differential thermal analyser, particle-size analyser, fusion apparatus and gamma-ray settler, has been installed. By the end of 1982 the laboratory was ready for commissioning, and a pilot plant was being installed. Six months of operational training had been foreseen in the project document, and the first fundamental phase of the project, at the time of publication of this booklet, was scheduled to be handed over for regular operation by November 1983. When that phase of the project is completed, Jamaica will have the distinction of being the first developing country with facilities for research and development in bauxite mineralogy and processing comparable to facilities in industrialized countries. The laboratory and pilot plant facilities will also function as a training centre for young scientists and engineers and give JBI capacity for sophisticated commercial work in mineralogical analysis for ores other than bauxite. In the long term, JBI will also be able to make its expertise available to other developing countries in line with the United Nations Development Programme's promotion of technical co-operation among developing countries (TCDC).

Assistance to the foundry industry

Certain industrial activities are indispensable to sustained economic growth, the absence of any one of which would cripple efforts towards national progress. UNIDO considers the foundry industry one of these essential industries, since it is complementary to all metalworking or metal processing. In view of its importance, a separate booklet has been prepared on this metallurgical sector.

GLOBAL ACTIVITIES

Since its inception in 1967, UNIDO has organized more than 30 meetings, workshops and seminars on various aspects of the development of the metallurgical industries in developing countries. Apart from a large number of papers submitted to such meetings, about 60 studies and documents related to the metallurgical sector have been prepared by various sections of UNIDO during the last 10 years and distributed to developing countries.

Examples of such global activities that are complementary to the implementation of technical assistance projects are given below.

In 1968, UNIDO organized an international symposium on the iron and steel industry, attended by representatives of almost 100 countries, both developed and developing. It organized a similar symposium in 1973. These symposia stimulated the growth of the iron and steel industry in developing countries and resulted in the execution by UNIDO of a number of technical assistance projects for the application of the latest and most appropriate technological innovations in iron and steel.

In 1978, UNIDO organized a seminar on the bauxite/alumina/aluminium industry for high-level government and corporate officials. It was attended by representatives of 17 countries – 14 of them developing countries. Based on the recommendations of this seminar, the following studies were prepared.

Elaboration of training and manning schedules for aluminium smelters

Pricing of bauxite from principal exporting sources

Economic use of aluminium

A workshop on a regional project for co-operative research among metallurgical research and development centres in Asia and the Pacific held at the National Metallurgical Laboratory, Jamshedpur, India, in December 1981 concluded that the establishment of a regional centre for co-operative research and development for the Asia and the Pacific region was highly desirable and a draft project document to this effect was elaborated.

Within the framework of global activities, UNIDO is closely co-operating with other United Nations organizations, such as the United Nations Environment Programme (UNEP). Joint activities covered include:

Organization of a UNEP/UNIDO Workshop on Environmental Aspects of Alumina Production, Paris, France, 20-23 January 1981

Organization of a UNEP/UNIDO Meeting of Experts on the Environmental and Resources Aspects of the Direct Reduction Route to Steelmaking, Puerto Ordaz, Venezuela, 26-30 April 1982

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

Metallurgical Industries Section
Division of Industrial Operations
UNIDO
Vienna International Centre
P.O. Box 300
A-1400 Vienna, Austria

Current booklets in this series

Agricultural machinery and implements (PI/82)
Building materials and construction industries (PI/76)
Foundry industry (PI/87)
Leather and leather products industries (PI/79)
Metallurgical industries (PI/83)
Petrochemicals (PI/75)
Pharmaceuticals (PI/77)
Shipbuilding and ship repair development (PI/80)
Wood processing and wood products (PI/78)