SOVIET INDIAN COOPERATION SERIES

SOVIET-INDIAN COOPERATION IN EASTERN INDIA

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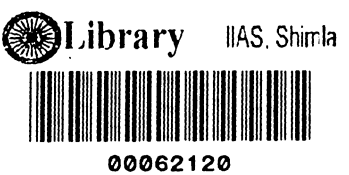

Soviet-Indian Cooperation In Eastern India

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Introduction

Economic cooperation between India and the USSR has been successfully developing for more than 20 years. There is today no important field of economy in which the two countries do not cooperate —be it steel or heavy machine-building plants, oil exploration or oil refining, power generation or manufacture of precision instruments, setting up of agricultural farms or sheep-breeding farms, monsoon forecasting or space exploration. This cooperation has helped India attain self-sufficiency in several sectors of its economy. A strong public sector has been built.

Close cooperation between India and the USSR is but natural. As close neighbours, the peoples of these two great countries have had contacts since time immemorial. As far back as in the fifth century, Armenian merchants had established trade relations with the Indian people and in the 17th century a group of Armenians settled in Calcutta and played an important role in the economic life of this country. Similarly, we find Indian traders in the 17th century active at Astrakhan and in the Volga delta region. Prior to that, the Russian trader and traveller, Afanasi Nikitin, who came to India and had extensively travelled in Northern India, left a detailed account of his personal experiences about this country and its people. In the latter half of the 18th century F.S. Yefremov came to this country, stayed here for eight years, and received the hospitality of the Indian people generously during his travel in its different parts. A stranger and a lonely Russian, at times travelling for miles on foot, he had found no occasion to disguise himself during that disturbed period as the British very often were forced to do.

The love and respect of the Russians for the Indian people and for Indian culture also found expression in the writings of the Russian musician and dramatist, Gerasim Stepanovich Lebedev, who

holds a special place in the history of development of modern Bengali culture. It was Lebedev who got a Bengali drama staged for the first time in Calcutta. The drama was written by him in Bengali, and he is rightly regarded as the pioneer of Bengali theatre.

As we intend to concentrate in this booklet on the eastern region, we do not propose to go through the entire gamut of present-day cultural, economic and political relations of the USSR with India before and after its independence. Still, some mention may be made of the keen mutual interest shown by Indian as well as Russian leaders of both political and cultural fields. In the early years of this century, the great Russian writer, Leo Tolstoy, entered into correspondence with Gandhiji supporting his form of the freedom struggle. Another great Russian writer, Maxim Gorky, in his letters to Indian revolutionary Madame Cama and Shyamaji Krishnavarma, showed keen interest in India's freedom. The interest taken by V.I. Lenin, the greatest leader of the Russian people, in India is well known. His contacts with the Indian revolutionaries of that period, like M.N. Roy, Raja Mahendra Pratap, A.J. Khairy and A.S. Khairy, Virendra Chattopadhyaya, Bhupendra Nath Dutta, Taraknath Das and others may be mentioned to illustrate the active interest Lenin had taken in India's struggle against imperialism and for freedom.

Indian leaders like Bal Gangadhar Tilak, Jawaharlal Nehru and others rightly saw in the emergence of the socialist Soviet Republic a true friend of the people fighting against the domination of imperialism and for national independence. The great Indian poet, Rabindranath Tagore, felt that his pilgrimage would have remained incomplete had he not visited the Soviet Union. Even during the last days of his life, when the heroic Soviet people were locked in a fierce battle against the Nazi hordes, Tagore had expressed a special concern about the war raging on the Soviet front.

This mutual respect and understanding between the peoples of the two countries, which had developed in the course of centuries naturally drew them closer after India attained its freedom in 1947. It was the first trade agreement signed in December 1953 between India and the USSR which initiated the all-round Indo-Soviet economic and cultural cooperation that developed in later years.

Here, in this booklet, we will attempt to focus attention on some areas of Indo-Soviet cooperation in Eastern India. While a number of useful literature on Indo-Soviet relations has been

published, cooperation between the two countries in the eastern region of India has not been dealt with separately so far. Hence this venture.

The spectrum of Indo-Soviet bilateral relations in this region covers such spheres as metallurgy, heavy machine-building, oil and gas exploration, power generation and also a long-term trade exchange in tea, jute, mica, batteries, hides and skins, etc.

Evidently, it would not be possible to give a detailed account of all aspects of cooperation mentioned in this tiny publication. It is, however, hoped that, as a first venture on the subject, the shortcomings of this booklet will be overlooked.

Steel City With A Human Face

Steel production is described as a barometer of a country's progress. In 1955, India's steel production was only 1.5 million tonnes. Of the four integrated steel plants in the public sector today, two have been built with the cooperation of the USSR.

They are also the biggest. One plant is at Bhilai and the other at Bokaro.

The history of the Bokaro steel plant may be recalled in brief. The US experts, while discussing the project, had expressed doubts about its technical feasibility. Their principal demand was that the Americans be given control over the building and operation of the plant : during the first ten years, US monopolies were to have complete control over the plant. India was also given to understand that American concerns had no intention of assisting India in strengthening its state sector. But Jawaharlal Nehru, the first Prime Minister of independent India, declared that, no matter what happened, Bokaro would be a state-owned plant. After this, the United States lost all interest in the project. In this situation the Government of India turned to the Soviet Union and, on January 25, 1965, the agreement for cooperation for building the Bokaro steel plant was signed.

The plant, in its initial stages, was designed to produce 1.7 million tonnes of steel. In 1970, an agreement was signed for the expansion of the plant's capacity to 4 million tonnes. At present, efforts are being made for its further expansion to cover 4 million tonnes. It is planned ultimately to expand the capacity of the Bokaro steel plant up to 10 million tonnes.

The Bokaro steel plant has reached its target of steel production for 1976-1977 by producing 900,000 tonnes of ingot steel. The plant has also achieved its target of producing 700,000 tonnes of saleable steel.

If Bhilai was the first outcome of Indo-Soviet economic co-operation, Bokaro reflects not only the widening of this cooperation but also stands as a testimony to the phenomenal progress that the Soviet Union has made in steel technology—a sphere in which it holds the leading place today.

At the same time, Bokaro demonstrates most effectively the Soviet approach to cooperation with the Third-World countries in their plans of industrialisation. For, unlike Bhilai, the emphasis has been on indigenisation. In the first stage, for instance, the import content was only 39.5 per cent; this will be reduced to about 20 per cent in the second stage. While constructing the first stage of the Bhilai steel plant the Soviet component consisted of 90 per cent in equipment and 77 per cent in metal structures; in Bokaro these figures were 35 per cent and 8 per cent respectively. Many public-sector undertakings in the country have played a key role in the development of the Bokaro steel plant. The Heavy Engineering Corporation (Bihar) and the Mining and Allied Machinery Corporation (West Bengal), which are Soviet-aided projects, have been the principal suppliers of mechanical equipment.

The USSR has given to Bokaro everything that is latest in steel technology. Its iron and steel products are of very high quality and that is why their export even to some developed countries is constantly on the increase. The gross sales turnover during 1975-1976 has been Rs. 783 million, including Rs. 146.5 million in foreign exchange.

When the second stage (4 million tonnes) is put into operation in 1979, the country will cover, to a great extent, its requirements in cold and hot rolled sheets for the import of which India now earmarks a large amount in foreign exchange. Depending on the demand in local market, a part of Bokaro products can be exported. Now the plant exports pig iron to Japan, Spain, the USSR and other countries: the exports in 1976-1977 totalled Rs. 30 crores.

The growth of this plant has enabled the country to cut down imports and, thus, save hundreds of crores in foreign exchange.

The Bokaro plant bears testimony to the fact that economic cooperation with the USSR helps the developing countries in becoming self-reliant.

The setting up of the Bokaro steel plant envisages the creation of an industrial zone with 300 auxiliary small-scale enterprises. Of

these, 65 have already been commissioned and 211 are at different stages of construction.

By now the Bokaro steel plant has put into operation four coke batteries, a sintering plant, three blast furnaces, a powerful slabbing mill "1250", a modern highly productive cold rolling mill and hot rolling mill "2000", and a number of other larger auxiliary units.

During the financial year 1977-1978, the Bokaro plant produced saleable steel to the tune of 814,976 tonnes, thus exceeding the previous year's production of 796,197 tonnes. The production of special steels like niobium steel and strapping steel and the production of the widest hot rolled strip in the country, of 1950-mm width, were some of the other highlights of the year's performance. Further, the plant exported 94,168 tonnes of hot rolled coils/slit coils; 14,276 tonnes of hot rolled sheets/plates; 10,299 tonnes of cold rolled sheets and 224,401 tonnes of pig iron. The exports totalled Rs. 35.29 crores.

The total turnover of the plant was Rs. 220 crores (approximately), which marks an appreciable increase over the past year's turnover of Rs. 193.2 crores.

In February 1978, the third blast furnace complex was commissioned by the President of India, Shri Neelam Sanjiva Reddy, marking the attainment of 1.7-million-tonne production stage of the plant. Speaking at the opening ceremony, the President said that the Bokaro steel plant was a vivid symbol of Indo-Soviet friendship and cooperation. He described the opening of the third blast furnace as a festive occasion for India as well as for Soviet workers in metallurgy.

The other major units commissioned during the financial year 1977-1978 were the cold rolling-mill complex, sinter band No. 2, converter 'B', air-separating unit No. 3 in the oxygen plant, etc.

Apart from the increase in production of the Bokaro plant, its products were exported to more than 20 countries. It is gratifying to note that the initial products of the cold rolling mill shearing line, more than 10,000 tonnes of cold rolled sheets, were exported to the USSR. This has been possible because of high level of quality maintained in all departments of the Bokaro plant. Products from Bakaro have been very well received in all export markets. During the period from October to Decemter 1977, the Bokaro plant has

exported 11,131 tonnes of pig iron to a number of countries like Japan, the USSR, Bangladesh, Poland, Pakistan, Singapore, Switzerland, Venezuela, Rumania, Yugoslavia and the FRG. From Bokaro were also despatched about 10,000 tonnes of slabs to Yugoslavia and 68,000 tonnes of hot rolled coils, the bulk of which have gone to the USA. About 13,000 tonnes of plates/sheets have been exported to countries like Kuwait, Dubai, Iran, Philippines, Pakistan, Hong Kong, Thailand and Indonesia. The total value of exports from 1972 till December 1977 was Rs. 85.63 crores, of which Rs. 55.12 crores have been accounted for during the years 1976 to 1978.

The training programme at the Bokaro steel plant is planned and carried out realistically, in accordance with the organisational needs.

Bokaro has its own training and development centre. It caters not only to the needs for a wide range of internal training and development of the organisation but also to those of other organisations, namely, HSCL, SAIL, MECON, BHEL, etc. In the initial years the emphasis was placed on bulk intake and training of fresh young men from schools, polytechnics and colleges in order to inject a trained personnel into the organisation. Apart from being trained in India, the employees and trainees are also deputed abroad, mostly to the USSR, in order to receive such specialised training for which facilities do no exist in India. All such persons take up a pre-deputation course in the study of the Russian language.

People coming from abroad are also now trained in Bokaro. For example, a number of Nigerian trainees—sponsored by the Nigerian Steel Development Authority (NSDA)—have already undergone training at Bokaro. So, Bokaro is more than a steel plant. It is a social phenomenon as well.

For instance, a new and vigorous approach to further improve the welfare of the people is being made in certain areas. There is now a growing realisation in Bokaro that welfare facilities are statutorily required to be provided and that housing, medical and educational facilities alone are not enough. The need to provide facilities to the employees to live a better and more purposeful life is also being increasingly accepted as a part of the welfare activities.

The Bokaro management has laid great stress on sports and recreational facilities. A programme of activities is drawn up each year in advance and this is so arranged that teams from Bokaro are

able to participate in sports and games organised by the Steel Plants' Sports Board, of which the Bokaro plant is a constituent. On the recreational side, the Cultural Committee of the plant organises local competitions in music, dance and instrumental performance. It also holds, at least once a year, *kavi sammelan*, *mushaira*, *qawali*, dance performance, etc. Artistes with a national status are invited for this purpose. All amenities of the Bokaro steel city are available, not only to the Bokaro plant employees, but also to a large population of the city (which is also inhabited by people working in other organisations) and to the supporting population. The city stadium is open to all. It has a capacity for about 20,000. Six reading rooms are being run in various parts of the city. The Bokaro management also plans to develop a full-fledged cultural complex, consisting of an indoor auditorium for 1,200, an outdoor auditorium for 5,000, a library with a capacity for 50,000 books and an arts block with facilities for an art gallery and for teaching in fine arts.

There is also a city park with a beautiful lake having its own fleet of boats, with houses having their roofs covered with evergreen creepers. This is a favourite place of recreation for Bokaro citizens. Soviet people working at Bokaro are invariably invited to participate in all functions held in the steel city.

As many as 15,188 permanent houses have been constructed and 5,212 more houses are under construction for providing housing space to workers and employees of the Bokaro steel plant. Bokaro also has a modern well-equipped hospital, where all employees and their dependants are entitled to receive free medical facilities.

All this enables us to call Bokaro a steel city with a human face!

Birthplace of Plants

An essential characteristic of cooperation between Indian and Soviet organisations today lies in the fact that detailed engineering for the projects covered by it is done not by Soviet organisations but by the Indian design organisation, the MECON (Metallurgical and Engineering Consultants). The MECON, located at Ranchi (Bihar), is known to many, especially to those who deal with the iron and steel industry. This is the biggest state institute in India for designing iron and steel projects. As is commonly said, it is in the MECON that India's metallurgical plants—the steel backbone of the industry of the country—are born.

The MECON was set up after absorbing its parent body—the Central Engineering and Design Bureau of Hindustan Steel. From 1970 onwards, the Indian specialists of this organisation have been working closely together with their Soviet colleagues. The MECON works in close cooperation with Soviet designers in steel projects.

Under the terms of a contract signed in 1969, the Soviet organisation "Tiazhpromexport" sent to India not only guiding materials and other valuable design documents, but also experienced Soviet experts. According to this contract, many Indian experts of the MECON were trained at the world-famous "Gipromez" of Moscow (central design institute) and at other well-known Soviet design institutes dealing with ore, coking coal, heavy electricals, etc. Today, the MECON has several site and branch offices at Bhilai, Bokaro, Durgapur, Rourkela, New Delhi, etc., apart from its head office at Ranchi.

The need for creating a design organisation like the MECON was badly felt in India. It was set up on the basis of a Soviet proposal. The USSR sent to this organisation its best experts who brought with them various guiding materials in designing, *i.e.*, results

of practically the entire experience of Soviet design engineers accumulated by them over the years. Indian specialists went to the Soviet Union to get acquainted with Soviet experience.

The Indian side was provided with analogous designs of entire plants and shops, and the MECON turned into a strong organisation almost from a scratch. Today the MECON has a staff of about 2,500 people who can tackle the most difficult tasks.

It is thus clear that the most complicated metallurgical units are today created and installed by Indian specialists independently, and a very important role in this is played by the leading public-sector design organisation, the MECON.

In the last few years, the MECON signed contracts for rendering engineering services in constructing projects abroad, including Algeria, Nigeria and other countries.

The MECON has today reached a stage where it has become practically self-reliant in technical consultancy and in design engineering work of metallurgical industries.

The MECON is India's largest design organisation in the public sector. Its engineers are today capable of solving all complex problems relating to the setting up of new metallurgical, aluminium, refractory and chemical plant, coke and by-products plants, etc.

The Indian experts of the MECON deal today with perspective problems of the comprehensive development of metallurgy, coal-mining industry, transport facilities, and power generation.

Workshop of Plants

The degree of industrialisation of a country can be judged, above all, by the degree of development of its engineering industry. Machine-building forms today the heart of basic industries, the foundation of the entire economy, without which it is impossible to ensure the genuine economic independence of a state.

Machine-building plants manufacture many types of machines, mechanisms and various instruments of production for all branches of economy. But a group of enterprises producing equipment for the development of basic industries occupies a special place in the specialised machine-building industry. These are the "plants of plants" the output of which is used for fitting metallurgical, ore-mining, coal, oil and cement plants. It is precisely these "plants of plants" which ensure the development of basic industries—the foundation of the economic strength of a country and of the growth in its people's welfare.

India was the first developing country which in its development programmes gave priority to the establishment of basic industries. And when, in fulfilling this programme, the need arose of building a heavy machine-building plant India found complete understanding and support on the part of the USSR. Thus, it was with Soviet economic and technical assistance that one of the three plants under the Heavy Engineering Corporation Ltd.—the Heavy Machine-Building Plant (HMBP)—was built at Ranchi. Its annual capacity is 80,000 tonnes of different heavy-engineering products for metallurgical, oil, cement and other branches of industry. The construction of the plant began in 1961 and was completed in 1964.

In accordance with the terms of the inter-governmental agreement, the Soviet Union carried out survey and design works, supplied nearly 45,000 tonnes of modern technological equipment, the required quantity of materials and also deputed a number of specia-

lists. Nearly 250 Indian specialists received training at various machine-building plants in the USSR.

Thanks to the joint effort of Indian and Soviet specialist, the HMBP at Ranchi has mastered the production of sophisticated metallurgical and other equipments. For the construction of the Bokaro plant, for expansion and of that of the Bhilai plant the HMBP supplied nearly 120,000 tonnes of equipments and the orders pending with the plant are for 63,000 tonnes. The HMBP ensures profitable operation and is constantly expanding the utilisation of the designed capacity.

The following comparative figures of production/sales indicate the trend during the last five years :

	1971-1972	1976-1977
Production (thousand tonnes)	34.0	42.0
Sales (Rs. in crores)	32.0	65.1

Source : Annual Reports of Heavy Engineering Corporation Ltd., 1971-1972, 1976-1977.

Today the plant produces blast-furnace equipment, coke-oven equipment, all types of rolling stock, electrical overhead travelling cranes of different capacities, crushing and grinding machinery, excavators, etc.

The plant's spacious production premises accommodate several big and unique metal-cutting machines, special stands, hundreds of units of machine-tool equipment and powerful cranes. The Soviet Union has delivered to the plant unique turning lathes for machining parts up to 20 metres in length. The reducer-shop is able to manufacture gear-wheels up to four metres in diameter and shaft-gears of up to two metres in diameter and up to seven metres in length. The bridge and special cranes with which the plants shops are fitted can convey parts and units weighing 100 tonnes and more.

Under the heading "Equipment Supply to Third Nations" Calcutta's *Business Standard* (23.1.1977) informed its readers that terms of the contract for supply of.....equipment by the Heavy Engineering Corporation to third-country projects undertaken by the

Soviet Union have now been settled. Supplies worth about Rs. 30 crores are to be made during 1977-1980."

In accordance with the contracts signed with Soviet foreign trade organisations "Tiazhpromexport" and "Tsvetmetpromexport" the HMBP carries out orders for supplying equipment to third countries. Such a kind of cooperation between the plant and the concerned Soviet organisations has good prospects for the future. It will provide for high-capacity utilisation of the plant, for continuous marketing of production, and for increase in profits.

The Soviet order for 19,000 tonnes of metallurgical equipment placed with the Heavy Engineering Corporation of India, under a protocol signed in 1976, is of great importance for India's heavy-engineering industry. The order, spread over the 1977-1980 period, is the biggest the HEC has ever received. But more significant is the fact that the USSR helped India enter, for the first time, the field of export of highly sophisticated metallurgical items to third countries. No country can enter this field without considerable promotional activities spread over a long period.

The HMBP is now manufacturing a large number of important equipments to Soviet-aided projects in third countries, *e.g.*, electrolyser pots for an aluminium plant in Yugoslavia, slab casters and certain coke-oven equipment for the Iskunderun steel plant in Turkey, metallurgical cranes for steel plants in Hungary and Bulgaria, bridge reloaders for a nickel smelter in Cuba, equipment for a rolling mill and continuous casting machines for Soviet-aided projects in Sri Lanka.

The HMBP, it is admitted, has to diversify its production not only to increase its revenues but also to meet the demand for machinery in the country. The plant's contribution in terms of machinery and equipment deliveries to national projects is significant. The sales of products to Indian plants and projects is given below :

(*Rs. in crores*)

1975-1976	1976-1977
53.66	62.77

The HMBP occupies on important place on the industrial map of India, being the premier manufacturer of heavy equipment and

machinery, especially for steel plants. It has already played a vital role in the development of India's steel industry.

It is today producing nearly 80 per cent of the entire metallurgical equipment made in India. Working to full capacity, its annual products can provide basic equipment for a plant turning out one million tonnes of steel per annum, which is equal to the production of the first phase of the Bhilai steel plant.

Among the major items manufactured by the HMBP are blast-furnance equipment, coke-oven equipment, all types of rolling stock, electrical over-head travelling cranes up to and including those of 450 tonnes capacity, pit-head cranes, Telpher cranes, excavators, rolling-mill equipment and other items for a number of industries. Apart from providing machinery and equipments for the Bhilai and Bokaro steel plants, the HMBP has been producing electrolysers for the Korba Aluminium Plant; equipment for the Mining and Allied Machinery Plant at Durgapur, Heavy Electricals Ltd., TISCO and others; and drilling rigs for the Oil and Natural Gas Commission. The plant also produced non-reversible cold rolling mill for mines which demands the most advanced technology, involving great sophistication and precision-machining of a high standard.

The HMBP is maintaining its role as a workshop of plants.

Industrial Giant in Coalfields

Another project of Indo-Soviet cooperation in the field of machine-building is the MAMC (Mining and Allied Machinery Corporation Ltd.) in Durgapur (West Bengal) with a production capacity of 45,000 tonnes a year. The MAMC is generally accepted as a prize possession of the modern Indian industry. This public-sector project, entirely built with Soviet cooperation, is the first of its kind in India and the largest in Asia. The plant was originally intended to manufacture only mining machinery. But now, with its most modern engineering workshops, latest technical know-how and highly trained work-force, it is capable of manufacturing different kinds of sophisticated equipments required for other industries including steel, power and fertilisers and for ports. In fact, the MAMC has emerged as the largest manufacturer of mining and material-handling equipments in India. The indigenous manufacture of sophisticated items, which were previously imported, has enabled the MAMC to effect significant import substitution and has thus helped the country conserve a valuable part of its foreign exchange.

Apart from supplying equipment for coal and coal-mining projects, the MAMC supplied 15,000 tonnes of equipment and conveyors (worth about Rs. 16 crores) to the 1.7-million-tonne stage of the Bokaro steel plant. The MAMC has also supplied 3,000 tonnes of material-handling equipment and conveyors to the Bhilai plant and to other steel plants. This reliability has brought to the MAMC another order from the Bhilai steel plant—to supply over 40 km of belt-conveyors of the plant's 4-million-tonne expansion stage.

The projects of Indo-Soviet cooperation vastly influence the emergence of small-scale industries. Thus the industrial zone at the Durgapur Mining and Allied Machinery Corporation includes 76 small-scale units which supply annually components and spare parts worth Rs. 250 lakhs. The MAMC's specialised ancillary development cell has helped establish a number of small-scale industrial units in

the Bankura-Durgapur-Asansol-Howrah-Calcutta belt. This has resulted in providing employment opportunities to well over 1,500 people and in increasing the consequent industrial activity by 50 per cent. The MAMC has helped the ancillary sector by providing assistance to these people in the form of know-how about production processing, special tooling, quality control, management and technical-ability development.

Presently, by manufacturing equipment for the new highly-mechanised mines and quarries and by modernising mining projects in operation, the plant is engaged in a nation-wide task of increasing the production of coal.

Thus, in May 1977 the MAMC started the serial production of the longwall/shortwall coal-cutting machine KMP-3, which was designed by the plant engineers in cooperation with Soviet experts. This machine embodies the latest improvements made in the design of coal-cutting machines and is suitable for use in bituminous and anthracite coal-mines and can be adapted for cutting in salt-mines or in shales. The machine has been certified as flameproof by the Director General of Mines Safety, India, and can be used in gas mines. Recently, the MAMC's engineers and Soviet experts prepared design documentation of a new Arcwall coal-cutter CA-2. The trial specimen of this machine is expected to be manufactured by the end of 1978.

The importance of coal for a nation's progress is beyond question. As a source of fuel, it coutinues to hold its own place even in the atomic age. All major industries in India consume millions of tonnes of coal every year. Again, coking coal or metallurgical coal is a vital raw material for making steel which is universally recognised as the index of a nation's economic advance. Coal and its by-products are essential raw materials for petroleum, chemical, fertiliser, pharmaceutical and a host of other industries.

India is fortunately endowed with abundant reserves of this valuable fuel. It is estimated that the discovered resources of coal in this country already run into 130,000 million tonnes, of which 13,000 million tonnes are coking coal. And every year new reserves are located.

But, till the end of the First Five-Year Plan, the most arduous jobs of coal-mining were mechanised only to a negligible degree. The limited mining machinery that was employed was mostly imported. Very often the imported machinery did not suit the conditions

of Indian mines and came in the way of introducing the most efficient and economical methods. It was thus found that the indigenous production of mining machinery was essential if coal industry was to make any appreciable headway. It was in this situation that the Government of India invited a team from the Soviet Union to advise it in the matter.

The project report prepared by the Soviet team was accepted by the Government of India, and the construction of the plant began in 1961. The Soviet Union provided credit, working drawings and equipment for the plant. Experts from the Soviet Union helped their Indian counterparts in the installation and working of the plant during the initial stage. The Soviet specialists helped train more than 1,500 Indian workers and technicians directly at the working site, and nearly 200 specialists from the plant have received their training in the Soviet Union, including 150 engineers and technicians.

The MAMC plant covers an area of 720,000 sq. m. and has currently a working strength of about 7,400. This is an integrated plant with its own machine and structural shops, iron and steel foundries, forge and pattern shops, heat-treatment, tool-design and modern paint shops and a well-equipped laboratory for metallurgical and welding purposes. The plant has also its own full-fledged design-and-technical-preparation departments manned by qualified technical personnel.

The production of the plant started from 1965 and has been increasing every year. This is evident from the following table :

	1970-1971	1971-1972	1972-1973	1973-1974	1974-1975	1975-1976	1976-1977
Production (thousand tonnes)	7.7	12.0	15.5	17.3	19.1	20.5	22.1
Sales (Rs. in Lakhs)	475	772	992	1521	2083	3025	3401

Source : MAMC Annual Report, 1970-1977.

The MAMC is today the leading manufacturer of mining equipment in India, including various conveyors, coal-cutting machines, hydraulic props, sintering and other units. During the initial years, due to lack of adequate orders for coal-mining machinery, the MAMC undertook a programme of diversification of production and

manufactured new items like bulk material-handling equipment for ports, material-handling equipment for steel plants, power and fertiliser project, and casting and forging for various industries. "In short, MAMC is at present the largest manufacturer of quality mining as well as material-handling equipment in India" (*Business Standard*, 22.1.1977).

Besides, the MAMC received some orders to send its products abroad. The first such order was secured in September 1976 when a protocol at Durgapur was signed between a Soviet team of V/o Tiazhpromexport and the MAMC authorities for the supply of belt-conveyors to Turkey for Iskurderun steel plant being built with Soviet collaboration. Recently, a report was published that the MAMC "has bagged orders for export of mining equipment to Afghanistan worth nearly Rs. 50 crores" (*Business Standard*, 14.7.1978).

The MAMC is now on the road to rapid progress and it has taken a leading role in the industrialisation of India.

Power Development with Soviet Cooperation

The USSR helped India set up both thermal and hydro-power stations utilising water, coal and lignite resources of the country.

Most of the power stations built with Soviet cooperation have reached their planned capacity and are today operating successfully. Following are the major projects built with Soviet assistance in Eastern India :

Name of the Station	Capacity in KW
Patratu Thermal Power Station (Bihar)	400,000
Balimela Hydro-power Station (Orissa)	360,000
Hirakud Hydro-power Station (Orissa)	25,000
	785,000

The power stations built with Soviet cooperation also include stations which are part of projects like the Barauni refinery, Bokaro steel plant and others. This indicates the magnitude of development work required to improve the power position as an important infra-structure for economic development. Many industrial units in India including the Hindustan Cryogenic and Chemical Plant, New Central Jute Mills, Hindustan Copper Corporation, Hindustan Zinc Ltd., and others are using diesel generating units of different types with a capacity varying from 3,500 KW to 400 KW supplied by the Soviet Union. Recently, the West Bengal State Electricity Board installed, under the supervision of Soviet experts, two Soviet diesel-generator sets at Siliguri with a total generating capacity of 7 MW, which would help improve the power position in North Bengal. But the leading role in power generation undoubtedly belongs to the big power projects. Thus, the 400,000-KW Patratu Thermal Power Station is particularly important for the development of the country's economy. Besides

meeting the power requirements of the Soviet-aided heavy machine-building plant, the Czechoslovak-aided foundry, forge and the heavymachine-tools plant (all in Ranchi), the Patratu station also meets the power needs of a number of ancillary industries around the heavy engineering complex. The station also supplies power to the vast coal-mining area in Ramgarh and gives a boost to the economic development of the Chhotanagpur region.

Situated at a picturesque spot among the forest-clad hills of Chhotanagpur plateau in South Bihar, the Patratu station appears before the eyes of a traveller like a giant fantastic cruiser with its 120-metre high smoke-stack chimneys. The Patratu station was built, with Soviet technical assistance, in accordance with a trade agreement signed on September 6, 1962 between the Government of India and the Government of the USSR. The agreement provided for the supply of about 40,000 tonnes of Soviet power equipment worth Rs. 22.35 crores in exchange for traditional Indian commodities. The power station was designed by the Moscow branch of the "Teploelectroproekt" (Thermal Power Design Institute) in consultations with the Bihar State Electricity Board. The foundation stone of the power station was laid on February 13, 1963, and the first 50,000-KW power-generating unit started commercial operation on September 28, 1966.

The Soviet design of the Patratu station also envisages the possibility of increasing the generation capacity of the station from 400,000 KW to 800,000 KW in future.

The main principles on which the station operates might be of interest to the readers.

At the Patratu station the power generated by units consisting of steam boilers, condensing-type steam turbines and power generators. Steam (that is pure gas without the slightest admixture of air) at a high pressure of 90 atmospheres (Kg/Cm^2) and under temperature of 535 degrees Centigrade goes from the boiler into turbine's cylinder where, after passing through twisted holes in each of the 22 static diaphragms, it flows at correspondingly shaped vanes of the turbine rotor, making the rotor to rotate with a speed of 3,000 revolutions per minute. While passing through the diaphragms and losing the pressure, the steam gains speed which is spent for thrust on the turbine's vanes. The rotor of the turbine rotates the shaft of the rotor, of power generator. To induce a magnetic field in the rotor, it is

supplied with low-voltage current, and under the influence of rotating magnetic field the alternating current with a voltage of 10,500 volts is created in the stator of the generator.

After passing through the turbines, the steam at a low pressure of 0.076 atmosphere goes into double-pass surface.condensers. The cooling water from cooling-towers is pumped into numerous pipes installed inside the condenser. Coming into contact with pipes, the steam is transformed into water at a temperature of 40 degrees Centigrade. After this, the water is heated first in the heaters at a low pressure, then deaerated and heated again in the heaters at a high pressure up to the temperature of 215 degrees Centigrade. A portion of waste steam is used as a source of heat in heaters.

All main production processes of the Patratu station are automated and controlled by modern instruments. This considerably simplifies the work of the service staff and ensures safe operation of the equipment.

The Patratu station receives its coal supply from the collieries of nearby Bhurkunda, situated in a major coal-bearing belt of South Karanpura. From the unloading bunkers the coal is fed by means of belt-conveyors to the crusher house, where it is crushed into small sizes of 16 mm by the hammer-mills and, finally, taken to ball-mills of various units for pulverisation.

Water for the power station for cooling purposes as well as for the township is supplied from the Nalkari Dam Reservoir, constructed nearby. The water from the reservoir is supplied to the water-filtration plant, from where it runs to the cooling-towers. To condense 1 tonne of steam into water at a temperature of 40 degrees Centigrade, 60 tonnes of cooling water at a temperature of 27.6 degrees Centigrade should be pumped from the cooling-towers. After this, water is to be cooled again in cooling-towers by splashing and by passing through an air stream sucked in by giant fans.

Soviet specialists worked at the Patratu station in the field of erection and as designers, adjusters, operation engineers and interpreters. Soviet specialists shared their rich experience and technical know-how in designing, erection and operation of power equipment with their Indian colleagues.

About 20 Indian engineers of the Patratu station have been trained in erection, operation, maintenance and control of thermal power station in Donbas—a coal-mining and industrial region of Soviet Ukraine.

While working in Patratu, the Soviet experts trained more than 150 Indian engineers, technicians, foremen, operators, etc., from Patratu and about 120 specialists from other thermal power stations.

The fruitful cooperation of Indian and Soviet specialists in the erection and operation of the power station helps a long way in developing coal-mining, heavy-engineering and steel industry, railways and several medium and small-scale industries in Bihar. Part of the power produced at Patratu can also be used for electrification in agriculture which in this way be saved from the vagaries of droughts, frequent in this region, if power-driven tube-well pumps are used for the purpose.

As has been said already, there are two hydro-power stations in Orissa—the Hirakud Hydro-power Station and the Balimela Hydro-power Station—which have been built with Soviet cooperation.

The Hirakud station was commissioned in 1963 and since then it has been working satisfactorily. This station is situated across the river Mahanadi, nearly 10 km from the Sambalpur railway station. The hydro-generating units for the Hirakud station were supplied by the Leningrad plants, which have supplied similar equipment to many other power stations in India. If the Hirakud station has a capacity of 25,000 kw, from the point of view of age its "younger sister" in the Balimela station (Orissa) is much more powerful: it has a capacity of 360,000 kw.

The hydel turbines and generators supplied for the Balimela station were manufactured by the Leningrad Metal Works named after the 22nd Congress of the CPSU. The "LMZ" trade mark of this plant, founded in 1857, is well known in the Soviet Union and abroad. Powerful turbines built by the highly skilled workers of this Leningrad plant are operating successfully at many gigantic hydro-power stations on the Volga at Bratsk, Krasnoyarsk, Ust-Ilimsk and at other well-known hydro-power stations in the USSR.

The turbines have been supplied and continue to be supplied to India, Poland, Rumania, Bulgaria and many other countries. These are already working very efficiently at such hydro-power stations as Aswan in the ARE; Tobka in Syria; Maika and Yamper in Canada; Kapivara in Brazil; Djardap iron gates in Yugoslavia and Rumania; and Hirakud, Bhakra-Nangal and Mettur tunnel in India.

The Balimela station is one of the most powerful hydro-power stations in India. Its six units supply electricity required for the

development of industry and agriculture in Southern and Eastern India. Calcutta's *Business Standard*, under the heading "Balimela Hydel Project Running in Full Swing", said: "Orissa, which was till recently surplus in power, was able to utilise that power and at the same time sell it to Bihar, West Bengal and Andhra Pradesh after one of India's longest high-tension transmission line connecting Balimela and Chainpal, near Talcher Thermal Station, was completed in 1974" (*Business Standard*, 28.1.1977).

It must be mentioned here that within only three years since the first unit was commissioned in 1974 and before the commissioning of the last unit electricity produced by the Balimela station has fully covered and reimbursed the costs of the equipment which was required for the construction of the station.

Specialists from the Soviet Union rendered help to Indian builders in the assembly, installation, adjustment and starting of the equipment including Soviet-made turbines and generators.

On an order received from India, the blueprints for the Balimela station were prepared by the Leningrad branch of the all-Union institute "*Gidroproekt*". The Balimela station is a prototype of the Soviet hydro-power station of the Hram-II type. The Soviet plants, taking into account the experience of Soviet Hram-II type of hydro-power station, have worked out projects and manufactured reliable equipment for the Balimela station. The Indian engineers had undergone technical training in the Soviet Union at plants which manufacture the equipment for the Balimela station as well as at Soviet hydro-power stations of the Hram-II type and of other types. The experience they acquired in the Soviet Union was ably used by them during the assembling of the equipment and building of the Balimela station. The Balimela station is now manned by highly qualified engineering personnel.

Balimela is, in fact, a complex hydro-technical project built in a hilly area. Several water reservoirs had to be built for the construction work. Canals, tunnels and other hydro-technical arrangements have also been made. Many roads have been built through the mountains as also houses for the personnel. During the construction work thousands of workers from all over the country went there to execute this tremendous construction work as manpower available there for this purpose was not adequate.

The installation of the main Soviet machines started in 1971

when the structure of the hydro-power complex was completed. Bringing these heavy machines to the construction site was not an easy job. They were loaded on sturdy lorries at Vishakhapatnam port and were brought to Balimela by roads—a difficult road, winding through mountains.

In 1973, the mounting of the first unit was completed. The engineers and other experts of the Soviet Union were invited to help in its mounting. The Soviet personnel worked shoulder to shoulder with their Indian colleagues. It is said that good relations among men is most important for the success of a work. Today we can say with confidence that in the construction work of Balimela very good and cordial relations were established between the Indian and Soviet engineers and workers. In reality, Balimela became a school for the engineers of the Orissa State. In fact, it is not limited to Orissa alone ; those who worked there are now working in several Southern and Central states of India.

The hydro-power station has a special importance for other industrial enterprises, because with the commissioning of the hydro-power station, they can work to full capacity. For this reason, it is necessary to complete its work with perfection and precision. Highly qualified technicians and work of high quality are required here. Generation and transmission of electricity is a continuous process, requiring 24 hours' work, and machines brought from the Soviet Union are fully capable of performing this work and are technically equipped for this purpose.

The Balimela station is completely automated. For example, the porject provides for current-pulsations and for control for setting the units in motion. This means that, when the pulsation in the system goes down, the units are able on their own, without the personnel on duty, to take any action, to go in motion and generate electricity. This is especially important for the supply of electricity to those plants which have an uninterrupted technological cycle, such as, for example, the aluminium plants (not far away from Balimela), steel-smelting plants, etc.

The highest capacity of maintaining the current-pulsations is secured by the sensitive and reliable regulators of the hydro-turbines. These electro-hydraulic regulators (EGR) of the Balimela station have been designed by and manufactured at the Leningrad Metal Works. The regulators of the EGR-type can provide for group regulations,

that is, an engineer on duty with only one key can control at a time all units, increasing or reducing their load.

Like other projects in India built with Soviet cooperation, the hydro-power complex at Balimela is a shining example of the results of close and fruitful cooperation between the Indian and Soviet engineers and specialists and a manifestation of friendship between the peoples of the two countries.

Partners in Trade

Trade has always been a vehicle of developing understanding between the peoples, a vehicle for exchange of experience between countries in creating material and cultural values. Trade links between the peoples of India and what constitutes the USSR today date back to 5th century A.D., a fact we have mentioned at the very beginning of this booklet.

After the victory of the Great October Socialist Revolution in Russia, the first Soviet products to enter the Indian market, in 1925, were crude oil, petrol, kerosene and sugar which successfully competed with the products of British-owned companies. In 1929-1930, 34 per cent of the entire kerosene imported in India was from the Soviet Union. In 1930, Soviet textile had gained popularity in India. But because of the resistance and pressure of the British oil companies (Royal Dutch Shell and Burma Oil) and of other British monopoly interests, Indo-Soviet trade was in fact reduced to nought in 1939-1940. In spite of the limitations imposed by British colonialists, the first Soviet trade agency was established in Calcutta in 1943 and trade ties between India and the Soviet Union, though very much restricted, revealed the wide potential of their expansion once India gained its independence.

After India achieved its independence, the first step towards establishing trade relations between the two sovereign countries was taken in 1950 with the conclusion of an agreement on regular sea communication followed by a barter agreement in 1951 for the supply of Soviet wheat in exchange for Indian tea and jute, two most important products of Eastern India.

The first trade agreement between India and the USSR was signed in 1953 for a period of five years, with a total turnover of Rs. 18 million in 1953-1954. Under the agreement, the Soviet Union was to export to India 39 items ranging from wheat, barley,

crude petroleum, petroleum products, industrial plants and equipments, mining equipments, textile machineries, tractors and other agricultural machinery and equipments to exposed cinematographic films, books, periodicals, etc. On the other hand, Indian exports included jute products, tea, hides and skins, leather and leather products, raw materials for drugs, books and periodicals, etc. Under this very agreement, Soviet trade offices were opened at Bombay and Calcutta which ushered in an era of ever-growing Indo-Soviet trade relations.

The total turnover of trade between India and the Soviet Union, which was only Rs. 18 million in 1953-1954, increased to Rs. 4,120 million in 1973. According to the fifth trade agreement signed in April 1976, it is envisaged that the total turnover would be Rs. 9,350 million in 1980.

For Eastern India this expansion of trade between the two countries has a special significance because the traditional Indian export items, like jute and tea, are finding an ever-increasing market in the USSR.

JUTE PRODUCTS

Jute forms one of the major export-oriented industries of India, especially of its eastern region. In West Bengal alone over 200,000 workers and millions of peasants are connected with the manufacture of jute goods and with the production of raw jute. This major product of Eastern India is facing the problem of continuous shrinkage of its foreign market in the West, with the result that the total world export of Indian jute, which stood at 931.2 thousand tonnes in 1964, decreased to 511.2 thousand tonnes in 1977. The total volume of export might have decreased further to a crashing low had there not been a phenomenal increase in the export of jute products to the Soviet Union.

Though jute was included as one of the items in the first Indo-Soviet trade agreement of 1953, the export of sizable jute goods to the Soviet Union started ten years later (from 1963). Till 1961-1962, the export of jute products amounted to only 25,000 tonnes. But two years later, in 1963-1964, the exports increased by nearly three times, to 71,000 tonnes, which was 8 per cent of the total exports. Since then, the export of jute goods to the Soviet Union has been

registering a steady increase. In 1977-1978, it went up to 135.2 thousand tonnes, worth Rs. 600 million or 26.45 per cent of total Indian export of jute products. It has been aptly noted by the organisation of the Indian jute-mill owners—IJMA— that while overall world exports have declined, exports to the Soviet Union have increased both in weight and proportion. Of the total exports of Indian hessian and sackings to the world market, 35-40 per cent and 40-45 per cent respectively are exported to the Soviet Union alone. Today, the Soviet Union has become a leading trade partner of India in this field.

TEA

As in jute, the Soviet Union has become a major purchaser of Indian tea as well. The export of Indian tea to the Soviet Union is also relatively recent, having started in the mid-'60s. Since then, however, the export of Indian tea to the Soviet Union has "grown astronomically", to quote an executive member of the Indian Tea Association. It may be mentioned that since the 18th century, when India started producing and exporting tea, Britain has been the principal purchaser of this product though today Indian tea is sold to 30 countries in the three continents of Europe. Africa and America.

The export of Indian tea to the Soviet Union showed a significant increase during the past years, and today its share of import of Indian tea is equal to that of the UK. From 1956 to 1975, the export of Indian tea to the Soviet Union rose from 6 million kg to 56 million kg—an increase by over nine times! While the Soviet Union's share in India's total exports was 7 per cent in 1961-1962, within a decade it went up to 21 per cent (in 1971-1972). Of the record shipment of Indian tea worth Rs. 244 crores in 1975, the Soviet Union alone absorbed Rs. 72.41 crores worth of it while the UK's share was Rs. 50.16 crores.

Though in terms of weight the UK's share is larger than that of the Soviet Union, in terms of value the imports of the Soviet Union are higher because it purchases high-priced Indian tea, a large part of which is the Darjeeling tea.

It should also be noted that the Darjeeling tea—which is high priced—constitutes 70 per cent of Indian tea exports, and the USSR,

being the buyer of this variety, gives Indian tea manufacturers a higher unit value. In the past few years the USSR has also been buying CTC tea from India. Today the Soviet Union accounts for about 20 per cent of total tea exports of India, and 90 per cent of the tea the Soviet Union imports is from India. Though in terms of weight the import of Indian tea by the Soviet Union in 1977 is less than that of 1975 or 1976, this decline is more than compensated by a considerable rise in unit value. While the unit value of the Soviet purchases of Indian tea was Rs. 12.37 per kg in 1975 (when the Soviet Union imported a record weight of 56.5 million kg of tea worth Rs. 63.61 crores), that in 1977 went up to Rs. 25.27 per kg. According to the Tea Board, till November 1977, India exported 39,223 tonnes or 19.46 per cent of its total tea exports to the Soviet Union, fetching Rs. 101.47 crores.

MICA

The Soviet Union is also one of the major buyers of Indian mica, a major mine-product of Bihar. Of the total export of mica worth Rs.16 crores in 1976-1977, that worth about Rs. 8 crores (or 50 per cent of the total Indian exports) was shipped to the Soviet Union. Of an annual output of 10,000 tonnes, only 5 per cent is consumed within this country and the rest is exported to 54 countries of the world. But the Soviet Union remains the largest purchaser of this product, offering the mica industry a steady market.

Apart from these major items of export from the eastern region of India, hides and skins, leather and leather goods, shellac, car batteries, etc., also form important items of Indian exports to the Soviet Union.

The agreement on exchange of books, periodicals, gramophone records, etc., between India and the USSR has not only helped develop trade in these fields but has also helped the peoples of the two countries to have a better understanding of their cultural life. Soviet books and periodicals are today quite popular with the Indian readers. Under an agreement signed in 1977, the Soviet Union would export 20,000 discs in exchange for 20,000 Indian discs to be exported to that country by the Gramophone Company of India, enabling the peoples of the two countries to understand the heritage of the East and the West in the field of music.

Cooperation in Scientific Studies

Cooperation between the Indian and Soviet scientists and scholars in different fields of science and scientific research ranges from space exploration to statistical-data analyses. Calcutta's Indian Statistical Institute (ISI) provides an example of such cooperation.

Under the programme of exchange of scientists between the ISI and the USSR Academy of Sciences, the visits of Academician Linik and of a number of Soviet mathematicians to the ISI in 1954 marked the beginning of a fruitful and active collaboration between the scholars and researchers of the two countries.

In 1958, the late Prof. P.C. Mahalanobis, founder of the ISI and a close associate of Rabindranath Tagore, who had visited the Soviet Union along with the poet in the '30s, was elected a foreign member of the USSR Academy of Sciences. In the same year, the large digital computer URAL, gifted by the Soviet Union, was installed at the ISI.

In 1963, Academician Kolmogorov of the Soviet Union spent three months at the institute. During 1977, distinguished Soviet scientists, e.g., Dr. Potapov, Deputy Director of the Far East Institute of the USSR Academy of Sciences; Academician L.V. Kantorovich, Nobel laureate in Economics ; Prof. V.M. Simchera of Moscow's Research Institute of Management; Prof. V.V. Sazanov of the U.A. Steklov Mathemetical Institute, Academy of Sciences of the USSR; and Prof. V.A. Statulyavishus of the Institute of Mathematics and Physics, Academy of Sciences of Lithuanian SSR, participated in the research, training and other scientific activities of the ISI. Among the Soviet recipients of ISI's D.Sc. (Honoris Causa) have been A.N. Kolmogorov, M.V. Keldysh, and Nobel laureate L.V. Kantorovich.

A new computer of the Soviet RIAD series will soon be installed and become operational. Its main function will be the development of software and continuation of statistical-data analysis. Indo-Soviet cooperation has played and continues to play a significant role in the development of the ISI.

For Increasing Coal Production

India, with the prospect of having a limited oil reserve, has, naturally, to concentrate on increasing the production of coal which it has in abundance. Keeping in step with the development of industry and transport, it has been planned to increase the annual output of this important fuel to about 150 million tonnes by the end of this decade.

In this endeavour of India, the Soviet Union is lending a helping hand, not only by setting up plants for mining machinery and equipments at Durgapur, but also in surveying and building new mines—both open-cast and deep—in Madhya Pradesh, Bihar and West Bengal.

The designs for these mines have been prepared by the famous "Giproshakht" Design Institute of Leningrad. The Soviet Union is also providing training to Indian engineers at the Soviet open-cast and deep mines and at reasearch establishments for mining.

The Indo-Soviet cooperation in this important field started in the early '60s when the agreement between the two countries was signed for developing several large coal enterprises in India. The agreement signed in 1966 to build open-cast mines in this country is now being implemented.

Under the agreement signed in 1976, the "Giproshakht" Design Institute of Leningrad is preparing the designs which would provide for the construction of mining facilities of Ramgarh coal deposit with an annual capacity of 3 million tonnes. New coal-extraction technology will be introduced in Chinakuri and Nakrakonda mines by long wall-face mining with subsequent roof-caving. The experience of Nakrakonda coal project and experimental project with an estimated reserve of 1.78 million tonnes, which has already started working will be utilised for developing Jhanjra coal project, to be developed with Soviet collaboration. The machinery for this highly-

mechanised project will be supplied mostly by the MAMC of Durgapur.

It may be mentioned that in working out the designs for the experimental mining at Nakrakonda seven departments of the "Giproshakht" Design Institute of Leningrad and five Indian specialists worked together, providing yet another shining example of Indo-Soviet cooperation in the development of this important branch of Indian economy.

Help in India's Search for 'Liquid Gold'

Oil is one of the most sensitive and essential commodities of the modern times, considered as yet another barometer of a country's economic progress. Modern transport is unimaginable without oil, and even for industry and agriculture it is vitally important as fuel and raw material. No wonder, oil is considered as 'liquid gold'.

Before independence India had no worthwhile oil industry. The erstwhile imperialist rulers and foreign oil monopolies were not interested in exploring India's potentiality as a oil-producing country. The first indication of India's oil reserves was received, as early as in the late 19th century, in Upper Assam when an elephant of a survey party carried from a marshy land some sticky substance on its body, which was actually the Digboy crude. But the colonial rulers showed little interest in the discovery. It was only in 1889 that the first well was drilled at Digboy and oil was struck there in 1890. It took ten years to set up the first refinery (a small one) in India—at Digboy. Though the British-owned Assam Oil Co., conducted a geophysical survey for oil in 1923, its results remained unknown and till independence the only refinery and oil-field in India was at Digboy. India was then completely dependent on foreign companies and on import of this vitally important commodity.

To promote the development of industry, agriculture and transport in independent India it was necessary for the country to have petrol, paraffin, diesel oil, lubricants, fuel, etc., available at cheaper rates. This demand of the economy could be met by setting up an oil industry in the public sector, It was for this reason that India, under the leadership of Prime Minister Jawaharlal Nehru, decided to develop its own oil industry in that sector. Meanwhile, the British-owned Assam Oil Co., declared that new reserves of oil had been found at Naharkatiya in Assam. Since India did not have its own expertise in the field, the foreign company succeeded in thwart-

ing the government's intention of developing Naharkatiya oil-field in the public sector. After five years' hard bargaining with the Government of India, the Oil India Co., was set up in the joint sector, with the British company having a controlling share for commercial extraction of Naharkatiya crude. In 1955, the Directorate of Oil and Natural Gas was formed by the government to prepare a state plan for oil exploration. This step of the government to develop oil industry in the public sector was strongly opposed by the international oil monopolies and by Western powers. They advanced the plea that since oil exploration was a costly and risky affair, India should not take it up in the public sector and "co-operation" of foreign oil companies in the field should be enlisted and ensured. The Government of India, however, stood firm on its policy decision of developing oil industry in the public sector. In this bid it tried for eight long years to enlist the cooperation of foreign oil companies by accommodating them in different ways. But the exploration for oil did not make any headway.

In 1955, following the agreement signed with the Soviet Union providing for the construction of the Bhilai iron and steel plant in the public sector, the then Union Minister for Natural Resources visited the USSR in the months of September-October to explore the possibility of getting equipments and of providing training to Indian personnel for oil exploration. In December a team of Soviet oil experts, led by M.A. Kalinin, came to India. This marked the fruitful beginning of Indo-Soviet cooperation for building a strong public sector in the field of exploration, extraction, refining and marketing of oil. After five months of on-the-spot study, the Soviet experts submitted a report which has come be known as the Kalinin Report. It stated that the prospect of finding oil was very good in a number of regions including the eastern region, provided proper prospecting work was undertaken. Meanwhile, the Directorate of Oil and Natural Gas had been reconstituted as Oil and Natural Gas Commission (ONGC) and raised to the level of a government department, "to plan, produce, organise and implement programme for the development of petroleum resources and production and sale of oil and petroleum products".

In November 1956, eight Indian drillers were sent to the Soviet Union for acquiring training and, in the next month, a gravity team and a scientific team from the Soviet Union arrived in India to assist in the work of actual prospecting for oil. Four months later, the

first test-well was spudded in Jwalamukhi and in September 1958 oil was struck there. Major success, however, was reported from Ankleshwar where, drilling with Soviet deep-drilling rig "Uralmash-3D", a major oil-field was discovered on May 13, 1960. Within two years, this field started producing 1,200 tonnes, thus saving India its foreign exchange worth Rs. 75,000 per day.

In December 1960 an ONGC team, under the guidance of Soviet experts, discovered oil in the eastern region at Rudrasagar in Assam. With Soviet field installations. deep-drilling operations have been and continue being conducted at Disangumukh, Gelki, Nazira, Lakwa, Teok, Dikhumukh, Najinijan in the State of Assam.

At Baramura, a massive reserve of gas has been found and a power project on the basis of this natural gas—another important fuel—is going to be built, which will open up a bright industrial prospect for this state. The gas can be used for setting up fertiliser units, for helping the tea industry, and also it can be transported to West Bengal and other neighbouring states in liquid form. It may be mentioned that a number of industrial units in Gujarat are using the gas supplied by oil-fields there. Assam has also proved quite rich in natural gas resources.

In West Bengal, where the prospect of finding oil is rated quite high, drilling has not so far proved a success. Problems like the drill getting stuck up before reaching the target depth—as in the cases of Bodra and Bakultala fields—are yet to be sorted out. Meanwhile, preliminary work for drilling at Radha Debagram in the district of Nadia has started.

A joint team of Indian and Soviet experts working on the geological findings in West Bengal has recommended in its reports (submitted in 1975-1976 and in 1978) a number of areas in the state for drilling. The findings of the Indo-Soviet team also suggest that there is a rich reserve of oil and gas in areas in and around Calcutta. In the off-shore areas in the Bay of Bengal, nearer the coast of West Bengal, the prospect of finding oil is rated high.

Thanks to Indo-Soviet cooperation, India, which had no expertise in the field of oil before its independence, now has a team of skilled workers and scientists in this field and a large number of equipments including deep-drilling rigs, structural rigs, work-over rigs, etc., which have been supplied by the Soviet Union.

* * *

Apart from exploration and extraction of oil, Soviet help and cooperation has enabled India to build its own refineries. In the eastern region, in Bihar, the Barauni refinery is yet another milepost in India's stride towards strengthening its economic independence. This refinery has been set up by the Indian Oil Corporation, a public sector organisation, in cooperation with "Tiazhpromexport" of the USSR. Its construction started in 1961 and the first one-million-tonne unit was commissioned in July 1964. Two years later, in February 1966, the second unit of another one million tonnes was commissioned and the lube-oil complex of the second million-tonne unit was completed in November 1967. The third one-million-tonne unit of the refinery was commissioned in January 1969.

With an installed capacity of three million tonnes, the Barauni refinery can refine more than 3.5 million tonnes. It produces today a wide range of petroleum products, e.g.. motor spirit, kerosene, aviation turbine fuel, high-speed diesel oil, light diesel oil, furnace oil, low-sulphur heavy stock, mineral turpentine oil, liquefied petroleum gas, lubricating oil, naphtha, bitumen, slack, wax, petroleum coke, etc. It refines a little over two million tonnes of crude annually. The crude is supplied by the fields of Naharkatiya and Moran oil-fields in Assam, which are connected with the refinery by a 1,152-kilometre pipe-line.

First Indian Metro

The first Indian underground railway is now under construction in Calcutta. It is also based on the project report prepared by Soviet experts under a protocol signed between India and the Soviet Union in 1970.

While the most of the railway-line is being constructed with diaphragm-walls by Indian engineers, the 700-metre-long tunnel, through the thickly populated area of North Calcutta, will be constructed, without disturbing the surface roads and houses, with the help of Soviet expertise, machines and materials. For this purpose, the Soviet Union will supply the required 5.5-metre-tunnel shields and the machine for underground tunnelling. A team of Soviet experts will supervise the work together with their Indian colleagues.

The Calcutta metro project, the first phase of which is expected to be completed by 1984, will help ease the transport problem of this premier city of the eastern region.

* * *

The Indo-Soviet cooperation is playing a vital role in the economy of the eastern region of India as it does in the economy of the country as a whole. This cooperation has helped establish in India basic industries like steel, heavy machinery, oil, etc., in the public sector, providing a strong base for economic development of not only the eastern region, but also of the entire country. Also, the increasing trade relations between the countries have helped India in expanding the volume of its exports particularly in traditional items like tea and jute, so vital to the economy of the eastern region.

It is with deep satisfaction that both the countries draw a positive balance-sheet of their mutual cooperation which has developed during the last two-and-half decades. They confidently look forward to a further all-round development of their close and friendly relations.

The cooperation between India and the Soviet Union is steadily expanding, covering ever new areas of life. It is a classic example of cooperation between the world's first socialist state and the third world. In its march towards strengthening its economic independence and achieving self-reliance, India receives the unstinted help of the Soviet Union. This is but natural for the Soviet Union which consistently follows the Leninist foreign policy of supporting the struggle of peoples for national liberation and social progress—a policy enshrined in the new Soviet Constitution.

This booklet aims at projecting to the readers the vast extent of Soviet-Indian cooperation in Eastern India, which has given birth to gigantic installations so vital to the modernisation of Indian economy. Though it covers only one region of India, it turns out to be a helpf understanding the d the entire gamut of S cooperation as it country as a whole.