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PERSONNEL TRAINING FOR  
THE IRON AND STEEL INDUSTRY  
IN THE USSR <sup>1/</sup>

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<sup>1/</sup> The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO.

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## SUMMARY

The paper deals with the effect of scientific and technical progress on the higher level of general and professional education on the part of the working classes. The discussion centres on the nature of personnel training in the USSR, the concern of the Soviet Government for the improvement and further expansion of the national educational system, the importance of education to the economic development of the country, and the procedure for the determination of specialist requirements for the national economy, and especially for the iron and steel industry.

All forms of personnel training for the metallurgical branch (workers, technicians, engineers and scientific staff) are analysed in the paper.

The training of skilled workers is the responsibility of the professional and technical educational system and of the on-the-job study programme network.

Medium-level specialist training is conducted at secondary specialized educational establishments. The system of the Ministry of Ferrous Metallurgy encompasses 73 technical schools in which technical personnel are trained in 76 different mining and metallurgical disciplines. Each year these ministerial schools graduate some 30,000 specialists.

The training of specialists with higher degrees for the iron and steel industry is the work of 131 advanced educational establishments throughout the country where there is instruction in 120 disciplines.

Particular attention is focused on the quality of the professional training of graduate specialists, the organization of on-the-job training, the preparation of experts for work in new specialities, and the updating of the curricula and study programmes of the advanced educational establishments and technical institutes in line with technical progress.

The paper cites data on the number of degree-holding specialists at work in the branch: engineers and technicians make up about 20 per cent, the ratio of specialists with higher education to those with secondary professional education standing at 1:2.

The training of scientific personnel for the iron and steel industry is handled in two ways. The first and principal approach is through post-graduate training organized at the Ministry's scientific research institutes and at the

departments of the educational establishments. The same action is through the external degree program for persons in full-time employment.

Additionally, the paper analyzes the system of skill-improvement opportunities developed by the Soviet Ministry of Ferrous Metallurgy for workers and engineering and technical personnel. Every year more than one-third of the entire work-force undergoes such retraining at on-the-job technical courses, special-purpose programmes and at schools where they are taught the latest working methods developed by the industry.

Engineering and technical staff improve their skills at the specially established Institute for Skill Improvement for Supervisors and Specialists of the iron and steel industry, as well as at the skill-improvement departments of educational establishments and at courses offered at their plants.

The paper calls attention to the assistance which the Soviet Union has made available to developing countries for the strengthening of their economies, including the area of the training of indigenous personnel for work in the iron and steel industry. In recent years, workers and specialists from 14 countries (India, Egypt, Iran, Algeria, Turkey, Finland, Cuba, Korea and others) have completed their training and apprenticeship at Soviet iron and steel works. Soviet field advisers working directly in the developing countries have played a major role in the training of such national work-forces. To this end, a Soviet methodological group has been organized at an Egyptian steelworks. A metallurgical technical institute is being set up in India, with the assistance of the Soviet Union, to train mid-level specialists for steelworks operations, at the same time that 10 Indian instructors are pursuing their studies at Soviet training centres.

The selfless assistance offered by the USSR to other countries in the development of their economies, the creation of modern industries and the training of qualified national personnel is a positive factor contributing to a faster rate of worldwide social progress.

The major scientific discoveries and technical achievements of the twentieth century have set the stage for a scientific and technical revolution of unprecedented scale and scope. The effect of this revolution is to transform in a qualitative sense the techniques and technological processes of material production, to change radically the substance and conditions of human labour, and to exert an ever-increasing influence on all aspects of social life.

Progress in science and technology is inconceivable apart from a substantial and continuous upgrading of the overall and professional training of working people and the satisfaction of the society's needs for scientific, engineering, and skilled personnel.

During the years of the Soviet administration a well organized system of personnel training has taken shape in the USSR, based on article 121 of the Soviet Constitution (Basic Law of the Union of Soviet Socialist Republics), which asserts: "Citizens of the USSR have the right to education". Within the course of several decades this law has been expanded and improved. Initially, the law provided for universal primary education; later, the concept of seven-year universal education was introduced, and then, at a still later date, eight-year education. Finally, in 1971, the Universal Secondary Education Act was passed.

This right to education is supported by an extensively developed system of secondary, professional and technical, secondary technical, and higher education, by a wide range of evening and correspondence school possibilities, by the tuition-free nature of all forms of education, by the state-administered scholarship system, by the use of local languages as the media of instruction in the schools, and finally by the organization of no-cost industrially oriented, technical, and agricultural training courses for workers at plants and factories, State and collective farms.

Every year the Government allocates large sums for educational purposes. For example, the State Budget Act of the Union of Soviet Socialist Republics for the year 1973 calls for a total allocation of 61,500,185,000 roubles (37.1 per cent of the State budget) for social and cultural measures, including general schools, technical schools, higher educational establishments, research organizations, and professional and technical training centres.

The Soviet Government has been and is constantly concerned with the improvement of the country's educational system.

In 1954, the Council of Ministers of the USSR and the Central Committee of the Communist Party of the Soviet Union (CC CPSU) adopted the decree "On the Improvement of the Training, Distribution and Utilization of Specialists with Higher and Secondary Specialized Education". This decree called for a broad-based programme for the further development of secondary and higher education.

Toward the end of 1958 the Supreme Soviet of the USSR adopted an act providing for increased relevance of school curricula to practical career situations and for further improvements in the Soviet public education system.

The year 1966 saw the issuance, by the CC CPSU and the Soviet Council of Ministers, of the decree "On Measures to Improve Specialist Training and to Perfect the Management of Higher and Secondary Specialized Education in the Country".

In this age of scientific and technical revolution the educational sector is acquiring ever-increasing importance in the economic development of the country. The objective requirements demanded of the educational and skill levels of working men and women are rising swiftly. Because of this, personnel training has become a key factor in the effort to achieve increased labour productivity.

As in the case of other branches of the national economy, personnel training for ferrous metallurgy is based on long-range projected requirements for these specialists. The branch's skilled personnel requirement is determined through the application of a scientifically devised method for ascertaining additional needs of ferrous metallurgy enterprises and organizations for graduate specialists with higher or secondary special educational backgrounds. Requirement schedules covering periods of five and ten years and beyond are drawn up by the Ministry of Ferrous Metallurgy of the USSR.

The training of skilled workers for these enterprises is accomplished within the system of professional-technical education and as part of official study programmes at the production facilities themselves.

Three-year professional-technical training centres have been set up at many ferrous metallurgy enterprises. On completion of the courses offered by such a school, the young worker will have acquired a general secondary education along with a skill in one of the working trades.

Worker training as part of the study programme at production sites may be in the form of individual or team ("brigade") instruction; at special courses; at so-called training-study course centres; or at training points.

These courses may run as long as six months depending on the degree of difficulty of the specialised subject matter and also on the amount of technical and economic knowledge required.

Midlevel specialist training is handled at establishments of secondary specialised education. The Ministry's system includes 73 technical schools, at which approximately one hundred thousand persons are receiving training, more than one-half of whom are full-time pupils. Every able learner receives a stipend from the State. Technical personnel are trained in seventy-six different metallurgical specialities.

Persons having an eight-year or general secondary education are admitted to the technical schools. The training period for daytime students who have already completed eight terms is three years and ten months, and for those who have completed ten terms - two years and eight months; the corresponding periods for evening students are four years and ten months, and three years and seven months, respectively.

The technical schools of the Ministry graduate an annual total of about thirty thousand specialists. Of this number, in accordance with the inter-departmental distribution plan, as many as 30 per cent of the graduates are assigned on a co-operative basis to positions in other branches of the national economy.



One hundred and thirty-one higher educational establishments are engaged in the training of specialists with higher educational backgrounds, in one hundred and twenty different specialty fields, for work in the enterprises and organizations of the metallurgical branch. Engineers are trained in the metallurgical sciences at metallurgical institutes and at specialized departments of the polytechnical and industrial institutes, while specialists in the areas of mathematics, physics and the other sciences required by the branch receive their training at the universities. Study courses at the higher educational establishments last five or six years.

A high degree of attention is centred, in the training of specialists, on the search for the most effective teaching methods and techniques. In their operating practices the educational establishments make extensive use of scientifically organized teaching procedures, modern technical aids, computers, film and television. The laboratories and study areas of these establishments are constantly supplied with the very latest equipment, including motion picture and television projection apparatus and other ancillary teaching devices.

The quality with which graduate specialists can be professionally trained is very largely determined by the content and methodology of industrial training. Practical application is fundamental to any theory of cognition, with the relationship between theoretical and practical knowledge the fundamental principle underlying the development of any science or productive undertaking. For this reason, practical work constitutes an organic element of the teaching process in Soviet educational establishments. The purpose here is the consolidation and broadening of the knowledge acquired in the classroom, along with the inculcation of the necessary skills and work habits required to function efficiently within one's chosen specialty area.

The curricula allot approximately 30 per cent of course time to practical training, which is conducted in three stages: (1) training practice, (2) on-the-job technical practice, and (3) on-the-job undergraduate practice.

The training practice stage is generally conducted in training workshops equipped with modern tools and equipment. The two successive stages are organized under actual working conditions.

With a view to improving industrial technology, a Ministry decree has assigned certain higher educational establishments and technical schools to specific enterprises and organizations of the branch to be used for this kind of practical training under actual working conditions. The most highly qualified and experienced engineers and technicians are recruited for this phase of the programme.

The constantly accelerating pace of technical advances in ferrous metallurgy makes it imperative that the specialist in this field be intimately familiar with the automation and mechanization of technological processes and with computerization, as these techniques relate to iron and steel production. For this reason, these requirements are reflected in the programmes of the educational establishments and technical schools in the form of curriculum changes and the introduction of new and more specialized study courses. More recently, measures have been adopted to train engineers and technicians in the area of process automation.

Greater emphasis is being placed on automation by expanding this subject area in the training curricula for process-control engineers in the major metallurgical disciplines in order to enable these specialists to develop new procedures and to design equipment and apparatus with an awareness of automation-related considerations.

Scientific personnel are trained for the branch in two ways. The first and principal method is through the post-graduate fellowship system set up at the Ministry's research institutes and also in the departments of higher educational establishments. The post-graduate term of study for intramural students is three years, and for extramural four. Such post-graduate study is open to individuals who have a higher academic degree and have successfully passed competitive examinations. All resident post-graduate students are eligible for Government scholarships.

The second approach is through the so-called associate status. This refers to engineers, employed at enterprises or research institutes, who have a special aptitude for science and who, under the guidance of assigned advisors, are engaged in the writing of their doctoral theses.

A total of 100,000 men and women, 90 per cent of whom are employed in the branch.

At the All-Union Student Conference held in October of 1961, L.I. Brezhnev, Secretary General of the Central Committee of the Communist Party of the Soviet Union, expressed high esteem for today's Soviet specialist. Such a person has an extensive academic and practical background, an expert understanding and knowledge of his specialized subject area, conspicuous organizational talents, and the ability to put to practical use the principles of the scientific organization of labour. Mr. Brezhnev went on to note that the personnel training system developed during the Soviet administration is essentially adequate to the country's needs, providing a means of supplying a flow of qualified specialists for all sectors of material production and intellectual endeavour.

As a result of the Soviet Government's concerned approach to the problems of personnel training, the iron and steel industry - along with other branches of the national economy as well - has available a sufficient number of graduate specialists. Engineers and technicians account for some 80 per cent of the persons employed in this branch, with the ratio of specialists with higher education to those with secondary education standing at 1:2.

Although these engineers and technicians are employed for the most part in engineering and technical positions, a certain percentage of technicians are used in jobs which by virtue of the complexity of the technology or the application of computer equipment require special knowledge. The Ministry has compiled a list of the kind of job positions to which technicians may be assigned.

Fast-breaking developments in science and technology dictate the need for personnel to keep constantly abreast of new advances in their areas and to upgrade their skill levels. To this end, the Ministry of Ferrous Metallurgy has devised a skill improvement system for workers and engineering/technical personnel.

Every year better than one-third of all workers upgrade their skill levels at on-the-job technical courses, special-purpose courses, advanced working method schools, at schools run by recognized authorities and the like. For

each such course is too study to be done at the enterprise - depending on the difficulty of the material to be assimilated and the educational background of the workers attending the courses - from six months without job interruption to three months with the worker's absence from his primary work assignment.

In addition to the skill improvement opportunities mentioned above, iron and steel enterprises and organizations have set up schools at which economic subjects are taught, and also public institutes (universities). At the present time, 73 such public universities for technical and economic subjects are operating within the iron and steel industry system, with the term of instruction ranging from one to three years. At these universities the students are given an extensive background in economics along with their purely technical subjects. The explanation for the need for such economics training lies in the fact that in the USSR workers are often called upon to assist in production and economic management.

Engineering and technical personnel can raise their skill levels at the specially created Institute for Skill Improvement for Supervisory Ferrous Metallurgy workers and specialists, at skill improvement departments set up at educational establishments, and at courses offered at their enterprises. Such training may or may not involve time away from the job.

Every year some 70 per cent of the entire pool of supervisory and engineering/technical staff are involved in skill improvement studies.

The major goal of skill improvement by supervisors and specialists is the study of the latest achievements of Soviet and foreign science and technology, scientific organization of labour and management using the most advanced computer techniques, the new planning and economic incentive system and the like.

The State also assists this skill improvement programme through the allocation of large sums of money. In addition to the fact that the training is on a tuition-free basis, workers improving their skill levels away from their jobs retain their average salary and are paid an allowance for housing and travel to their place of study.

Every year more than 10 million roubles are spent on skill improvement in the ferrous metallurgy industry.

Personnel training and skill improvement contribute to the successful performance of this industrial sector, which in 1972 gave the country 113,303,000 tonnes of steel, 22,200,000 tonnes of pig iron and 83,807,000 tonnes of finished rolled stock.

The Soviet Union is a source of continuous and unconditional assistance to the developing countries in the strengthening of their economies, including the training of national personnel to staff domestic iron and steel industries.

In accordance with intergovernmental agreements, contracts are concluded which provide for the on-the-job and technical training of workers and specialists at metallurgical enterprises of the Soviet Union.

In the contract (No. 8000/1 of 12 February 1966) concluded between the Foreign Trade Association GKES (State Committee on Foreign Economic Relations of the Council of Ministers of the USSR) and its Iranian counterpart it is stated: "The practical technical training of the customer's specialists and manual workers (theoretical and practical studies, curriculum planning, Russian language instruction and interpreter service) will take place free of charge". Similar clauses are normally included in contracts with other countries.

In recent years, workers and specialists from fourteen countries (India, Egypt, Iran, Algeria, Turkey, Finland, Cuba, Korea and others) have received their training and apprenticeship certification at Soviet iron and steel plants. Every year the number of workers and specialists arriving in the Soviet Union for training in metallurgical skills has increased. In 1972 the number of foreign specialists who came for this purpose reached 1,272.

Foreign citizens are trained at more than fifteen of the largest enterprises of the branch: the Novolipetz, Taganrog, Krivoy Rog, Makcev and Uzbek metallurgical plants, the Kuznets, Orsko-Khalilov metallurgical complexes, and others.

The term of instruction is as long as twelve months. For each trainee the enterprise organizes a special programme which takes into account the specialist's particular wishes. The training is in the hands of highly qualified engineers and technical personnel who share generously their technical knowledge and practical experience. An experienced interpreter is assigned to assist the foreign nationals, who are instructed in groups of three to five persons. In special cases, depending on plant conditions, an interpreter may be assigned to a single person. At some plants the instruction is given in the foreign national's native language.

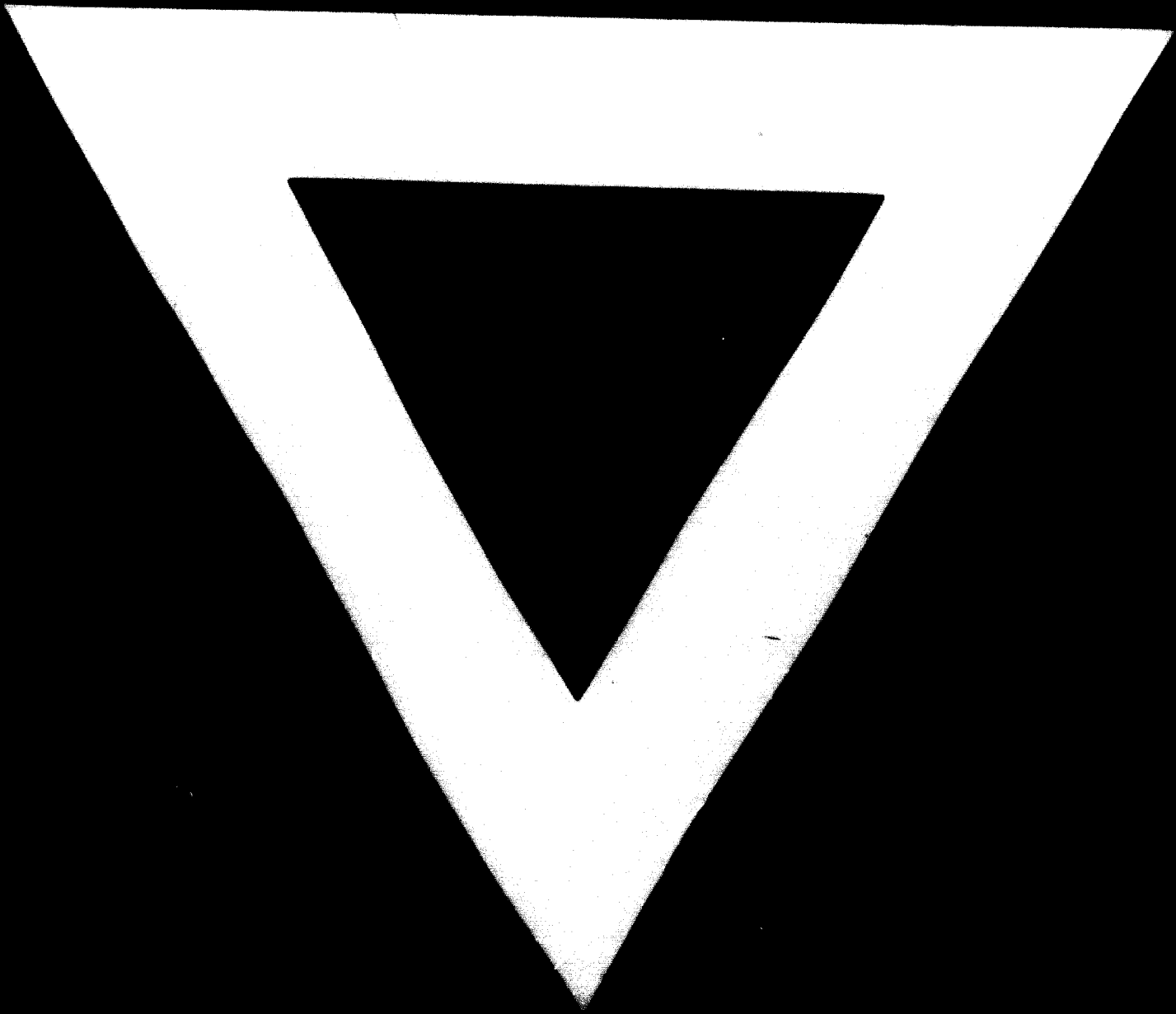
Workers and specialists are trained in blast furnace, steel melting, and converter operations; the handling of tar-dolomite refractories, control and measuring equipment and automatic systems; the servicing of gas, steam, and transport facilities and other aspects of metallurgical operations.

Returning to their native countries, these workers and specialists are in a position to play an active role in the production sector and to discharge their professional responsibilities in an effective manner. Many engineers and workers from various developing countries who have undergone training in iron and steel works in the USSR have voiced high praise for the experience that they have gained in the Soviet Union.

Soviet specialists located directly on the scene in the developing countries offer great assistance in the training of national personnel. For this purpose, a group of Soviet experts and specialists has been organized at a metallurgical plant in Egypt, while at the Kremikovtski Steel Works in the People's Republic of Bulgaria there is a technical training unit of Soviet specialists for the instruction of local people.

At Bhilai, in India, a metallurgical technical school for the training of midlevel specialists to work at the metallurgical plant is being organized with the assistance of the Soviet Union. In connexion with this fact, ten Indian instructors are undergoing apprenticeship training at technical centres in the USSR.

The unconditional assistance of the Soviet Union to other countries in the development of their economies, in the establishment of modern industries, and in the training of national personnel is a positive contributing factor to a quickened pace of worldwide social progress.



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