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Second Interregional Symposium
on the Iron and Steel Industry

Moscow, USSR, 19 September – 9 October 1968

C - 10

REQUIREMENTS OF MANPOWER AND QUALIFIED STAFF ON THE CREATION OF THE
IRON AND STEEL INDUSTRY AND TRAINING OF PERSONNEL

by

O. Malukha

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by

O. Malukha, USSR

SUMMARY

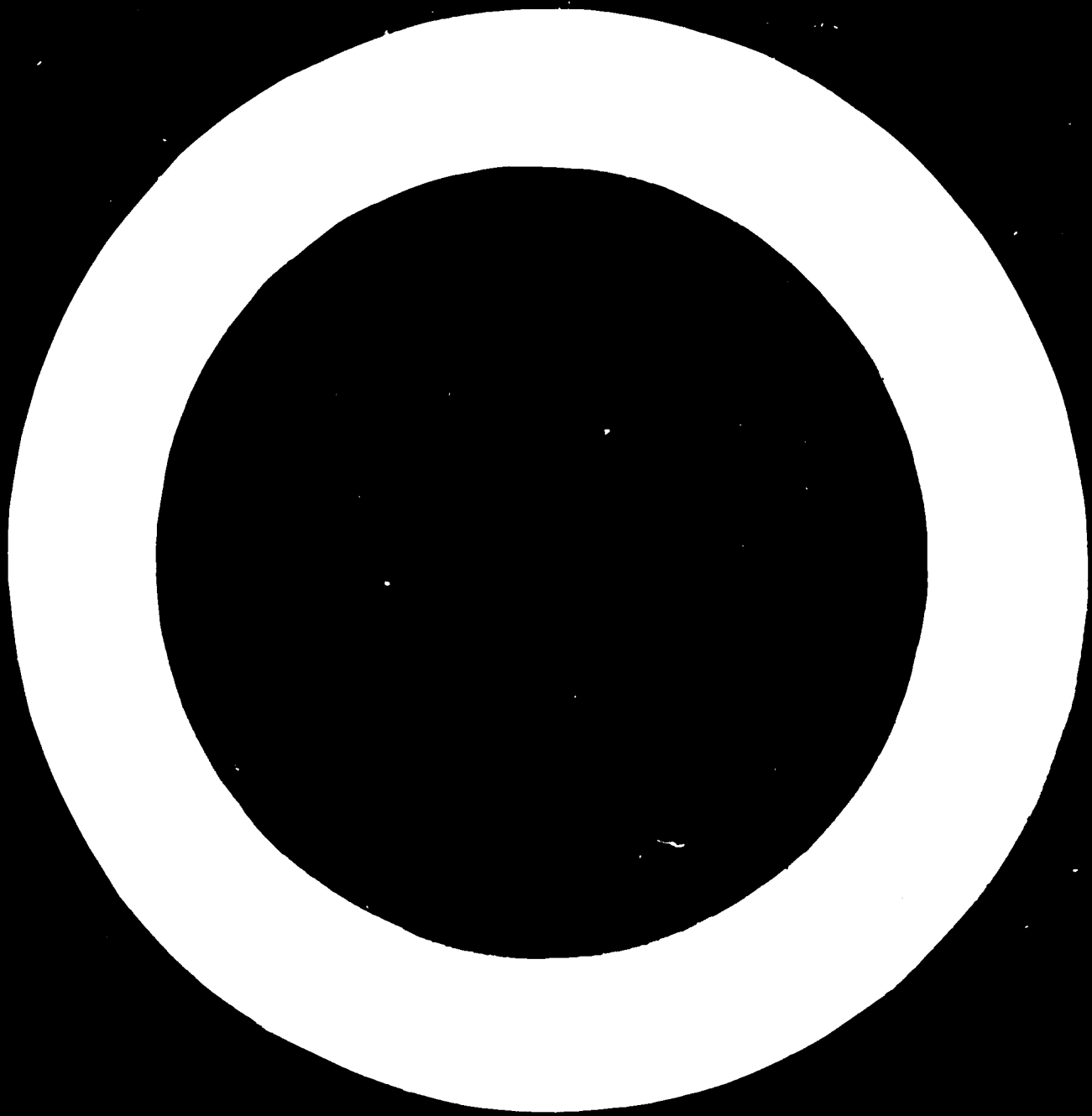
When establishing new iron and steel works, one of the main problems - which must be solved considerably in advance - is that of providing and training the necessary number of workers. This problem is of particular importance nowadays because complex and expensive equipment is now used in the iron and steel industry.

The utilization of this equipment to the full and its smooth and uninterrupted functioning are of great economic significance, and it is therefore essential in every case to devote great attention to the training of the personnel of new works.

The technical sophistication of the equipment used in new iron and steel works not only presupposes a high level of skill and training of the operating personnel, but also calls at the same time to an even greater extent for highly-qualified technicians and supervisory staff. The numerical ratio of manual to non-manual workers is growing smaller. Productivity is increasing, while the amount of physical labour expended is simultaneously being reduced.

* This is a summary of a paper issued under the same title as ID/WG.14/17.

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For these reasons, it is essential to begin in good time to train the necessary number of skilled personnel for new iron and steel works which are being constructed.

The problems of training and preparing the necessary supply of workers for the iron and steel industry vary from country to country.

There are basically three main types of areas:

1. Areas which have a low level of industrial development and few technical schools, and where there is no existing iron and steel industry;
2. Areas which are partially developed from the industrial point of view but where there is no balance between the existing industry and the level of technical schools;
3. Areas which are both industrially and technically developed.

In the case of the first type of area, the assistance of advisers of wide all-round knowledge and great experience is required. These advisers should bear responsibility for the development of the iron and steel industry from the beginning of the economic study to the entry into operation of the works, and should also be responsible for the training of skilled workers.

In the case of the second type of area, only technical assistance is required in the establishment of the works and the training of the technical staff required.

Countries in the third category are capable of solving all the problems connected with the development of an iron and steel industry themselves and are also capable of helping the countries of the first two categories.

In the training of technical management personnel it is essential that such personnel should gain a thorough knowledge, in industrially developed countries, of the way to run an iron and steel industry, methods of long-term planning, and the organization of labour.

The future technical management personnel should be trained in industrially developed countries both in technical institutions of various levels and in

actual plants and planning offices. As at the present time there are still not enough training institutions of an adequate technical level in the underdeveloped countries where iron and steel plants are being constructed, technical personnel from these countries must continue to receive their theoretical training as well in industrially developed countries.

Skilled production workers and specialists in the repair of machinery and electrical equipment, automation equipment, and measuring and regulating apparatus must be trained, like the foregoing personnel, in industrially developed countries.

All the workers for a new plant can be trained on the spot, where new iron and steel factories are being built, but this calls for the lengthy presence of a considerable number of qualified instructors and is not a very effective method compared with the preceding one.

The rank-and-file workers and the semi-skilled personnel are, however, usually trained on the spot.

Experience so far has shown that it is best for the largest possible number of workers to be trained in iron and steel works in industrially developed countries on similar equipment to that which they are to use. An iron and steel works is a collection of various different component plants which receives raw material, processes it, and finally despatches the end-product for use in engineering. According to statistics, only some 18 per cent of the workers in iron and steel plants are engaged directly in the metal production process. The remainder are divided among the repair, transport, power and refractory sections and the so-called ancillary and auxiliary plants. This means that there are heavy demands on the organizing ability of the management, the personnel of which must be highly qualified.

In addition to their general long-term training, management personnel can advantageously make a detailed study of the establishment of an actual iron and steel plant. This specific training of the management personnel should begin with the analysis of the data of studies and projects for the establishment of the iron and steel plant in question and should cover the whole period of construction up to completion.

Technical management personnel of future plants who possess the appropriate technical and theoretical knowledge should work as assistants to corresponding management personnel in the steel works of highly industrialized countries, where they can gain a definite insight into the technical management of the future plant which they are to run.

The training of personnel for new iron and steel plants in countries with an under-developed iron and steel industry must form part of the preparations organized well in advance.

In drawing up plans for the establishment of an iron and steel plant, it is necessary even at the earliest planning stage to make provision for obtaining the necessary number of both manual and non-manual workers for the various sections of the plant. In deciding on the number of workers required, account must be taken not only of the work load of the individual sections, repair shops, laboratories and so forth, but also the detailed breakdown of the various operational sections and the requisite qualifications of the workers for them, the various pay structures, and the required length of training. In preparing a plan for the recruitment of the labour force it is essential to take the following into account:

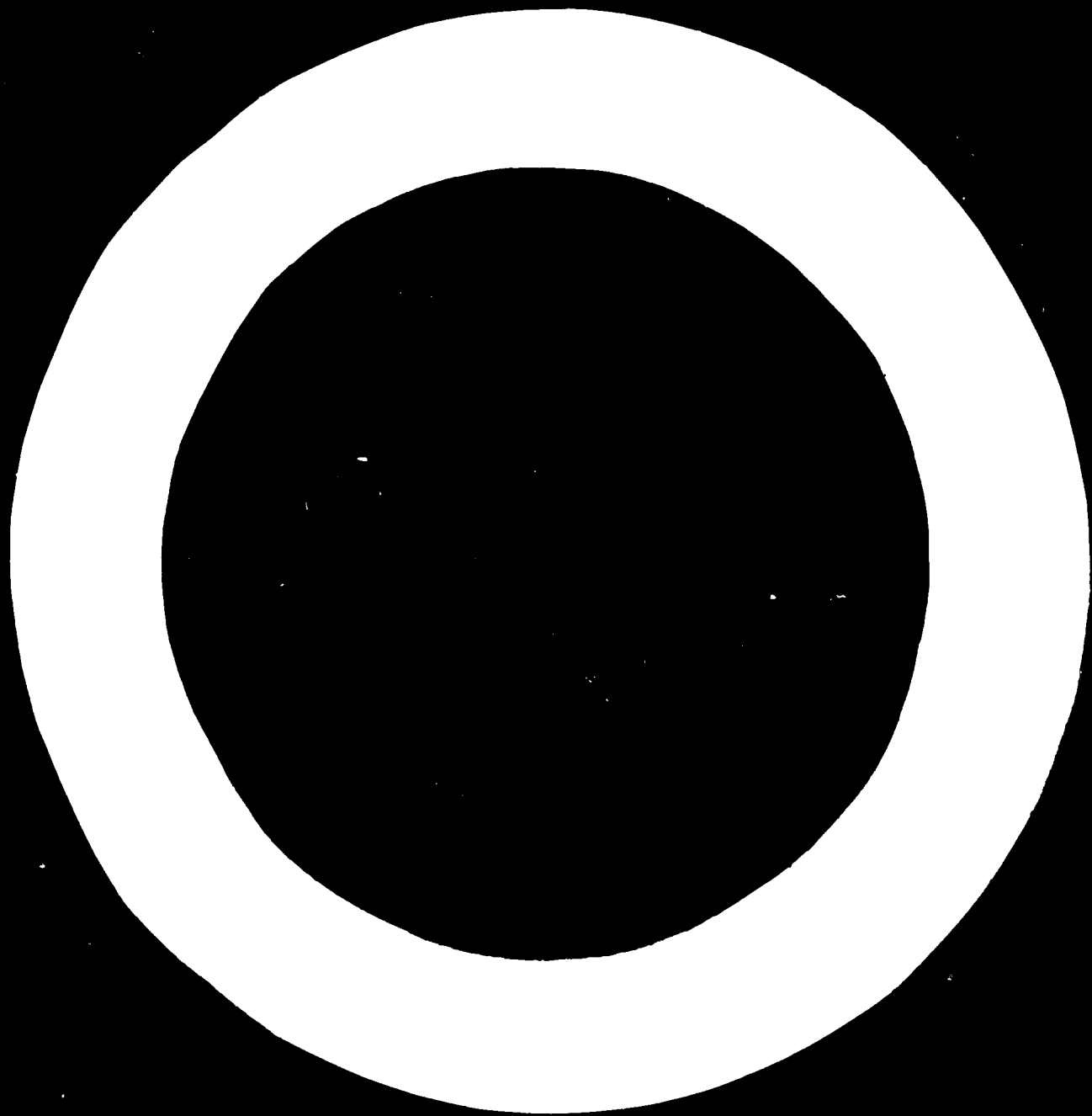
1. The absolute increase in the total number of workers relative to the construction plans and the volume of production;
2. The variations in the number of workers as a function of the volume of production for the various trades;
3. The sources of labour;
4. The factors affecting the stabilization of the staff at the new plant (apartments, hostels, schools, etc.).

Satisfaction of the foregoing conditions must be ensured in the plans through preliminary discussion with the appropriate State or public organizations.

In the last few years, a number of iron and steel works have been brought into production in Czechoslovakia. These plants have been established both in areas with a well-established tradition of producing iron and steel and in less-developed areas.

In the second of these cases, the direct expenditure on the training of workers comes to approximately 0.5 per cent of the total investment in the construction of a new iron and steel plant. Experience shows that good training of skilled workers makes it possible to cut down the time required for bringing iron and steel plants into full production and reduces stoppages in the operation of the main items of equipment.

The foregoing considerations about the preparation and training of workers for iron and steel plants are of general applicability. While they can prove to be fully applicable in specific cases in individual countries, however, it is essential to make allowances for the particularities of different areas and countries in projects for the construction of iron and steel plants.



Introduction

An index - albeit a rough one - to the great development of industry in the world as a whole and the spread of industrial areas is provided by world steel production.

In 1900, steel production for the whole world was about 28 million tonnes.^{1/} By about 1950, it had risen to 188 million tonnes. By 1955 world steel production had risen to 270 million tonnes, by 1964 to 438.1 million tonnes, and by 1966 to 474.5 million tonnes.

It can be assumed that by 1975, world steel production will reach 540 - 580 million tonnes per year.

It is to be observed that a substantial increase in steel production is taking place, not in the traditional industrial countries, but for the most part in the Socialist countries and Japan. Moreover, the "centre of gravity" of iron and steel production is shifting to countries which do not possess a highly developed steel industry but possess important sources of raw materials, or else to areas which, although some distance from sources of raw materials, have the advantages of easy sea transport and a large potential supply of technically skilled and capable personnel (as in Japan).

By way of explanation, I will support my statements with some statistics for the period 1955-1966: i.e., the last eleven years.

For my final figures I am using those for the year ending 31 December 1966, because when this report was worked out and prepared 1967 was not yet over.

I shall give first of all the figures for the so-called "major States with a large iron and steel industry" - i.e., the USA, the USSR and Japan - then the group of Socialist countries of Europe, including Yugoslavia but excluding the USSR, then the group of capitalist countries of Europe, and finally the group including so-called developing countries such as Brazil and India.

It is interesting, at the same time, since the data in question can be considered comparable, to follow the growth of employment in ferrous metals production in general compared with the output of steel. In this way it is possible to obtain a picture - although admittedly only a roughly indicative one - of developments in the productivity of labour and the technical equipment, and to form some idea of the technical equipment of ferrous metals plants and the requirements for skilled labour in this field of industry.

^{1/} The word 'tonnes' used throughout this document denotes metric tons.

Thus, for example, the production of steel in the USA rose from 106.173 million tonnes in 1955, via a fall in 1961 to only 88.197 million tonnes, to 121.630 million tonnes in 1966: an increase of 14 per cent.

In Japan, steel production rose from 9.408 million tonnes in 1955 to 47.784 million tonnes in 1966: an increase of 508 per cent.

In the USSR, production increased from 45.271 million tonnes in 1955 to 96.5 million tonnes in 1966: an increase of 114 per cent.

In the Socialist countries of Europe, i.e., the Czechoslovak SSR, the German Democratic Republic, Hungary, Romania and Yugoslavia, production rose from 15.012 million tonnes in 1955 to 32.324 million tonnes in 1966: i.e., an increase of 114 per cent.

In the other European countries, production increased by 56 per cent, i.e., from 77.851 million tonnes in 1955 to 121.305 million tonnes in 1966.

In Brazil, production rose by 192 per cent, in India by 278 per cent, in the Republic of South Africa by 52 per cent, and so forth. It is to be expected that in Brazil and India - countries with rich iron ore deposits - there will be further great growth in the iron and steel industry, as the production of crude steel in kg per head of population is extremely low in these countries, amounting to only 40 kg per head in Brazil and only 13 kg per head in India. Further growth of the iron and steel industry in other countries is also to be expected.

The object of this paper is not to examine and analyse the positive and negative arguments on which decisions as to the location of new iron and steel works must be based, as the factors involved differ from country to country and it is necessary in each specific case to evaluate them carefully and come to economically and politically sound and thoroughly analysed decisions. At the same time, however, it must be borne in mind that a steelworks consists of equipment which is intended to last for a very long time, is extremely complex and extremely costly.

In every case of the building of a new iron and steel works, one of the leading problems has always been, continues to be, and will always be that of the provision and training of the necessary personnel.

It must be understood that this question has assumed more importance than ever before because we are now dealing with equipment which is technically extremely complex and involves heavy investment costs. Its uninterrupted and faultless running at full usable capacity is of such great economic significance that in every case it is advantageous to devote the greatest attention to the training of the workers of new steel works, even when this training involves relatively heavy expenditure.

We consider it of value to give some figures showing the relationship between the output of steel and the number of workers employed in the iron and steel industry as a whole in several selected countries (see Table 1).

From the four cases selected, it is possible to draw specific conclusions of considerable importance for the training of personnel.

1. From the increasing productivity of the worker it is possible to judge the technical level and equipment of a steel works and the consequent requirement for higher qualifications among the workers.
2. These technical requirements of the equipment, which concern the qualifications of the workers, are marked by the fact that the ratio of manual to non-manual workers is dropping, and this means that as time goes on it will be increasingly necessary to plan for work of a technical and management nature, which will increase at the expense of physical labour.

This experience strongly emphasizes the need for the early training in adequate numbers of the requisite skilled personnel for new iron and steel works.

The problems of recruiting and training new personnel are once again of a varying nature. In general, however, it is possible to speak of three types of areas for the development of an iron and steel industry:

- A. Areas where industry and technical institutions are both at a very low level and there is as yet no iron and steel industry.
- B. Areas which are more or less industrialized, but where industry is not on the same level as technical institutions. These areas include both areas where the iron and steel industry is at a very low level of development and other areas which are more developed and have a commensurate iron and steel industry.
- C. Countries which are well-developed industrially.

Table 1

Country	1955	1965	1955-1965 index	1966	1955-1966 index
1 Steel output, mln. tons	106 173	119,260	1,123	121,630	1,141
2 Total labour force, thousands	624 764	583,851	0,935	-	-
3 Tonnes per member of total labour force	170,5	205,0	1,205	-	-
4 Manual workers, thousands	519 145	458 539	0,884	-	-
5 Tonnes per manual worker	205	260	1,27	-	-
6 Ratio, total labour force/ manual workers	1:4,91	1:3,66	-	-	-
<hr/>					
1	9,408	41 161	4,37	47 784	5,07
2	184 804	314 875	1,70	-	-
3	51	130,8	2,565	-	-
4	154 919	257 965	1,662	-	-
5	60,7	160	2,66	-	-
6	1:5,18	1:4,7	-	-	-
<hr/>					
1	24 501	36 821	1,5	35 316	1,44
2	342 597	398 991	1,16	378 220	1,11
3	71,5	93	1,3	93	1,3
4	294 758	323 975	1,10	301 900	1,023
5	83,0	117	1,41	117	1,41
6	1:6,12	1:4,3	-	1:3,95	-
<hr/>					
1	4 474	8 599	1,92	9 128	2,04
2	107 763	159 909	1,47	165 378	1,51
3	41	53,8	1,31	55,0	1,34
4	82 975	118 482	1,43	122 784	1,485
5	54	72,6	1,34	74,5	1,37
6	1:3,2	1:2,88	-	1:2,88	-

Case A These areas need the assistance of consultants with wide all-round knowledge and great experience, who should be responsible not only for the development of the iron and steel industry, from the establishment of the basic economic requirements up to its entry into operation, but also for the training and instruction of the future workers.

Case B These areas only need technical assistance in the building of the works and the training of personnel (particularly technical personnel).

Case C Areas (countries) in this category are capable of solving all matters connected with the establishment of an iron and steel industry themselves and are also capable of providing assistance to areas in categories A and B.

The training of technical personnel for developing areas

(a) Management personnel

This category of personnel must be trained in highly developed industrialized countries. Management personnel must gain a knowledge of the way to run the industry, methods of long-term planning, and the organization of labour at all levels.

(b) Technical management personnel

Future technical management personnel must also be trained in highly-industrialized countries. Their training must not only take place in technical training institutions, but also in actual industrial enterprises and in planning departments.

As long as the training institutions of developing countries are not at the appropriate level, these personnel must receive even their theoretical training abroad.

(c) Skilled production workers and specialists in the repair of machinery, electrical equipment, automation equipment and measuring and control equipment must be trained, like the preceding group, in areas with highly-developed industry.

As an alternative, training can be organized on the spot, but this calls for the dispatch for a lengthy period of a considerable number of instructors and is not as effective as the foregoing method.

(d) Semi-skilled and unskilled workers are usually trained on the spot. All experience, however, points to the advisability of training a relatively large number of such workers on operational plant in areas which are highly developed industrially.

The inherent problems of training and preparing personnel

The overall production cycle of an iron and steel works, which covers the delivery of the raw material, its processing and its final dispatch in the form of a finished product for use in engineering and other connected industries, involves a variety of component plants where very diverse trades are carried on.

When it is borne in mind that according to statistics only scarcely 18 per cent of the workers in an iron and steel works are employed in the actual production process, the remainder being distributed over the repair, transport, power and refractory shops and other so-called ancillary and auxiliary plants, it becomes quite clear what a high degree of organizing ability is called for from the labour management staff and what specialization is called for from the various technical management personnel and the specialized and highly specialized technical personnel.

Modern practice has very clearly demonstrated that management personnel, in addition to receiving a long-term general theoretical training at appropriate technical institutions, should also receive specific training in the actual establishment of an iron and steel works.

This specific training begins in practice with the preparation of the specifications and actual plans for the construction of a steel works, and it must be considered to be an indivisible part of the establishment of a new works, to the smooth running of which it is an essential prerequisite.

Future technical management personnel of steel works which are being constructed should, if they have an adequate theoretical technical background, be designated directly as assistants, with corresponding duties, in iron and steel works of highly industrialized countries, where they will gain the necessary insight into the technical and technological management of the section of the plant which they are to run.

When they lack the necessary theoretical technical education, this must be made good either by normal training at appropriate educational institutions or by abbreviated courses, supplemented in both cases by the requisite practical experience in actual iron and steel works.

In the case of personnel required in order to set up a plant in the same area, such as an area in category B above, the quickest and most economical method is to transfer such personnel from existing works.

The training of personnel for their duties in iron and steel works, particularly in countries which do not yet possess an iron and steel industry but wish to build up a comprehensive and economic one, is something which must be begun well in advance and carried out in accordance with a plan.

For technical and economic management personnel, this training should consist of eight to ten semesters at higher technical institutions, supplemented by at least two semesters study of the language of the country where this higher technical training is to be given.

In the last eleven years, the VShB (Higher Educational Institution for the Mining Industry) in Ostrava has trained over 90 specialist iron and steel production engineers who have now returned to their countries and are there occupying positions of responsibility in iron and steel factories which have been built there. In addition, over 60 mining engineers have been trained.

A year-by-year summary of the number of foreign students is given below (see following table).

Year	Subject:	
	Mining engineering	Iron and steel production
1957	56	76
1958	50	63
1959	30	48
1960	46	33
1961	31	31
1962	48	38
1963	43	30
1964	42	35
1965	37	35
1966	27	38
1967	14	62

All the students took special language courses to prepare them for the actual technical training.

They were housed in student hostels and fed in student canteens.

It may be of interest to note that the training given at our Higher Educational Institution covers all aspects of the given field, (in this case, iron and steel production), so that every student who completes the course there and who has the necessary personal initiative and progressive approach can carry out any specialized duty within this wide field.

Both sections of the Higher Educational Institution are concerned primarily with training their students for actual production work and include a general faculty which deals with general mechanical engineering and the construction of equipment for the iron and steel and mining industries.

The various departments of the Institution include departments on automation, calculating techniques, economics and so forth, so that the theoretical training of those who complete the course is really wide and gives them a proper grounding for any speciality or profession in the iron and steel industry.

The figures for foreign students at the Ostrava Institution listed in the table above include students from twenty-nine developing countries in Africa, Asia and Latin America.

Up to 1959 there was a preponderance of students from Korea, and from 1962 to 1966 there were a number of students from Cuba. This is in full accordance with the political evolution and development of these countries at the times in question.

The training of other personnel

Even as early as the drawing up of the general project to construct an iron and steel works, the planning staff must work out the requirements for workers for the individual sections of the plant, including staff appointments.

The requirements for workers are worked out from a chart showing the progress in setting up the various plant sections, repair shops, laboratories and so on.

The requirements are prepared in the light of a detailed analysis of each individual job, bearing in mind the qualifications required the wage structure, and the length of training necessary.

The detailed composition of the basic personnel requirements and the actual provision of these workers for iron and steel factories is subject to the following factors:

1. The absolute increase in the total number of workers in accordance with the above-mentioned chart showing progress in building and starting up of production.
2. The development of the labour force with the starting up of production, the workers being divided into:
 - (a) Management staff trained in higher educational institutions;
 - (b) Management staff with a secondary technical education;
 - (c) Lower technical staff;
 - (d) Skilled workers, divided up according to their specialities or trades;
 - (e) Unskilled workers;
 - (f) In areas where women are employed in industry, the number required and the jobs to be done by them should be specified.
3. Geographical considerations in connexion with sources of labour

Stability of the labour force plays an important role in the future operation of the works. Consideration should therefore be given to the question of where the various sections of the labour force for an iron and steel works are to be recruited.

- (a) In the case of women, it is proposed that they should be from the local area;
- (b) In the case of men it is proposed that figures should be decided upon for the number of men from:
 - (1) The local area
 - (2) Other areas
 - (3) The number of unmarried men

4. Sources of labour

An extremely important factor is that of the sources of labour. A demographic survey of the labour potential in the area where a new iron and steel works is to be built should be carried out in co-operation with the appropriate institutions and authorities to establish what possibilities there are of finding sources of labour.

The following are the main fields of recruitment:

- (a) Local sources and sources from nearby surrounding areas.
- (b) Sources outside the general area of the new works
- (c) More distant sources.

Recruitment can be of two types:

- (a) Organized recruitment by the Government or area authorities
- (b) Free recruitment carried out by the undertaking itself.

5. The stabilization of the personnel of the new works

A detailed analysis of the number of workers must also be carried out and used as a basis for the determination of:

- (a) The number of apartments required for permanent employees in the area of the works;
- (b) The number of beds required for the accommodation of workers coming from further away;
- (c) The number of beds required for accommodating unmarried men;
- (d) The requirements for apprentice schools and hostels;
- (e) The requirements for civic amenities, such as:
 - shops
 - schools
 - communications facilities
 - food supply facilities
 - sports facilities
 - cultural facilities such as cinemas, theatres and libraries.
- (f) In the case of developing countries, it may be desirable to take measures to promote interest in the profitability of the future

works among selected skilled and other workers.

(g) Facilities for transporting the workers to their workplace.

The requirement for workers for building the new factory should also be shown in the project, but their provision, housing, and so forth will be the responsibility of the construction enterprise. We will not go into this matter in this paper, although it must be borne in mind that a considerable number of workers will be recruited in the local area or in the surrounding areas and that a considerable number of these workers, after completing construction of the steel works, will remain in it as production workers.

Moreover, it can be assumed that a considerable number of buildings, such as hostels and so forth, erected for communal purposes during construction of the steelworks can and will be used for the needs of the permanent staff of the works when it starts production.

The actual training of the workers

On the basis of the plans laid down for a new iron and steel works and its labour requirements (divided up according to trades and qualifications), measures must be taken, simultaneously with the actual construction of the works, to arrange for the recruitment of the requisite key workers.

An important element in the provision of this labour is the exploration, discussion and fixing of the sources from which it is to be drawn. This must be done in close co-operation with the appropriate State or public bodies of the area or country in question.

By describing a single case of the construction of a new iron and steel works in Czechoslovakia, I should like to demonstrate ways of providing and training the necessary workers which can be used, with certain modifications, as the basis for the preparation of the specialized workers for new iron and steel works in any part of the world where the iron and steel industry is as yet not very highly developed, such as for example the countries of Latin America, India, the countries of Africa and so forth.

The basis for the decision to establish the iron and steel works in question in the chosen location was that that location, which was in an area where there had hitherto been no iron and steel industry, was conveniently situated for the

transport of raw materials from the industrial areas of two neighbouring countries. The production programme of the new works consequently supplements the production programme of the whole State and was approved by the highest State bodies, in conjunction with the planning department for the development of the national economy.

In view of the presence of a highly developed iron and steel industry and of higher educational institutions giving appropriate training in other parts of Czechoslovakia, we did not need to turn to other countries for assistance in the training of the technical and economic management staff.

Only where equipment was to be provided by foreign firms were arrangements made for the technicians and skilled workers who would be responsible for its operation to undergo a short training course at the makers' factory.

As already stated, the iron and steel works in question was of medium size (according to present day views on the optimum size for an integrated iron and steel works), and its construction was divided into two basic stages, the first stage of which consisted of the construction of the plant for the self-contained metal production cycle.

The labour requirements for the project, broken down by individual years, were as follows:

Year	Total number of workers	Manual workers	Technical and economic personnel
1961	1,600	912	688
1962	3,000	2,000	1,000
1963	6,055	4,500	1,555
1964	9,115	7,000	2,115
1965	12,100	9,500	2,400

Around the nucleus of workers concerned with the construction of the new works there grew up, in a planned manner and in accordance with the rate of construction, the future team of skilled technicians and specialized workers, supported by the whole industrial potential of the Czechoslovak Socialist Republic.

A glance at the table shows the thoroughly sound and well-planned nature of the build-up of the initial labour force - particularly the technical and economic personnel - in the initial years of the construction of the new factory.

Additional requirements for workers and technical and economic personnel, together with the sources from which these requirements were filled, were as follows:

1. <u>Workers</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>Total</u>
Additions:	534	1088	2500	2500	2500	9,125

Sources of these additional requirements:

(a) Transfers	78	270	369	296	100	1,140
(b) Direct recruitment	333	482	696	375	1003	2,889
(c) Trainees	-	276	193	293	118	880
(d) Training away from the works	123	60	1215	1535	1279	4,213

2. Technical and economic personnel

	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>Total</u>
Additions:	433	312	555	560	285	2,145

Sources of these additional requirements:

(a) Transfer of qualified personnel	100	60	103	98	15	376
(b) Direct recruitment	333	199	170	74	62	838
(c) Training away from the works	-	53	282	388	208	931

These requirements were already foreseen in the staff training plan of the new works, and arrangements were made one or two years in advance (depending on the level of skill and the length of training needed) for their fulfilment.

Obtaining workers by transfer

Obtaining skilled or qualified personnel such as technical and economic personnel, senior workers, shop foremen, foremen, smelters, rolling mill operators, repair workers, etc. by having them transferred from operating iron and steel enterprises or mechanical engineering works, power undertakings and so forth is the quickest way of starting up a new factory.

Only a small proportion of the necessary workers can be obtained by this method, however.

The difficulties met with in trying to obtain workers by this means are the following:

- Other works are extremely reluctant to release their senior and experienced skilled workers.
- The workers themselves are extremely reluctant to leave their workplace, where they have become accustomed to the existing surroundings, on account of the following factors:
 - Family ties;
 - Property considerations;
 - Reluctance to change the surroundings in which they live;
 - Mistrust of new surroundings;
 - Fears about the new problems which may arise at their new workplace (these are by no means last in importance);
 - Fears about the possibility that a worker may not be able to obtain work at his former level if he happens to be transferred back to his original factory.

There are thus new problems for a new undertaking. Transferred workers must be given:

- The chance of better pay;
- An appropriate temporary or permanent flat;
- Adequate cultural possibilities;
- The possibility of visiting their families, etc.

The direct recruitment of workers

What is meant here is the direct free recruitment of those workers - whether they be production workers or administrative personnel - whom it is proposed to train directly at the workplace. These are primarily workers in respect of whom the requirements for special qualifications are lower, or else workers who will be under the direction and training of more senior employees who, with due account to the required qualifications, have been trained at other enterprises away from the works which is being built.

Training away from the actual works

Training away from the new works was carried out on a relatively large scale not only in view of the importance and the future technical equipment of the new steelworks, but also because the industry of the other parts of the country had the technical equipment to make such training possible.

Only to a small extent were workers sent abroad for training. This was only done in the case of workers who were to deal with certain types of equipment which had not hitherto been used in Czechoslovakia and were being supplied from abroad. In these cases, a small number of skilled workers were given training abroad so that they could familiarize themselves with the operation of the equipment and with the latest technology which had not yet come into use in our country.

Generally speaking, the problems encountered were similar to those arising in direct transfers, although this was not always so.

The workers trained away from the new steelworks were mainly those for the transport, power, rolling mill, smelting plant, blast furnace and sinter, coking, casting and repair departments. A training plan showing also the length of training and the place (enterprise) where it was to be carried out was prepared for every job and every worker.

The training and preparation of these skilled workers was carried out, in accordance with training possibilities and trades, at all the iron and steel works of the country and at over thirty mechanical engineering, chemical and power plants and undertakings.

At the same time, some workers were selected and sent for training in medium and higher technical educational institutions.

The organization of the training of workers

The actual organization, practical supervision and responsibility for the training of workers lay with the factory which was being constructed.

Higher Government organs took the necessary preliminary steps to ensure the effective progress and completion of this training. The plan of labour requirements and the training programme, including its financial implications, was approved by the Government, and the appropriate Government departments were given the job of ensuring its preparation and completion.

In spite of the fact that the necessary arrangements had been made and agreements concluded along these lines, however, the actual practical business of training and preparing the workers called for exceptionally great care and organizing efforts, as this was practically the first time that such measures had been taken on such a scale in our country.

The numbers of workers to be trained, which had been worked out and prepared by specialists, served as the basis for the further development of similar training plans.

For manual workers, detailed training plans were worked out according to classes of skill, while general plans were worked out for the various branches, in each case covering definite groups of workers.

For engineers and technicians, a concrete training plan was worked out for each individual employee. This plan also set the length of training.

The fulfilment of the labour requirements which had been worked out as above and corrected from the point of view of duration of training and number of trainees was guaranteed by the signing of agreements between the new steelworks and the workers and also between the new works and the works where training was to be given.

It may be noted in this connexion that it was essential to make provision in the plan and to provide legal guarantees for the reimbursement both to the persons being trained and to the enterprises training them of expenses arising during training.

All the workers were therefore placed on the strength of the new works automatically from the very beginning, with all the rights and obligations arising out of this working relationship.

After this, in their capacity as workers of the new factory, they were sent by the management for training. Appropriate agreements and undertakings were entered into between the new works and the training enterprise, and the trainees were under the obligation to conform with all the accepted procedures in force at the training works.

On completion of their training programme, the trainees were gradually brought into the working procedures of the new factory, this being done in such a way that they participated in the final phases of installation of the technical equipment.

In the detailed training plan provision was also made for the trainees to receive, in addition to the practical part of their instruction, suitable compulsory instruction with a view to broadening their theoretical knowledge.

A certain number of selected workers concerned with the servicing of the equipment were sent for training to the supplying factories so that they could familiarize themselves from the very beginning with the operation of the equipment and its servicing.

Material incentives in the recruitment and training of personnel

This question is more or less of a specific nature for our country, but under certain circumstances our experience can remain applicable, with certain modifications, to other countries where there is not a direct surplus of labour.

On recruitment, it was necessary to give the workers certain material compensation, not only to make up for increased living costs, but also as a material incentive.

Therefore, workers who signed an agreement to stay at the new works for a certain length of time were paid a monetary bonus when they joined, the balance of the money being paid at the end of the agreed period, which was two to five years on average. It can be assumed that after this length of time the new worker has already become accustomed to the works and usually stays at it.

At the same time, it was necessary to provide workers undergoing training with appropriate accommodation, cultural facilities and facilities to visit their families, and to arrange for the repayment of expenses incurred by them as a result of living away from their families.

A further incentive for attracting workers initially and creating interest among them is the granting of terminal bonuses on completion of the planned training.

Total financial expenditure incurred in the preparation and training of key workers

The State budget included a certain definite sum to cover all the expenses connected with the preparation and training of the workers for their new trade. These expenses were as follows:

Basic wage and salary fund	57,210,000
Bonus fund	472,000
Expenses outside the basic wage and salary fund	<u>10,086,000</u>
	<u>67,768,000</u> Korunas

The actual direct expenditure per worker, in the sense of the sums actually paid to them personally during their training, came to 20,520 Korunas.

As far as the failure rate in the training of workers was concerned, the total number of trainees who dropped out during their training and preparation was 1,277, which represents about 25 per cent of the planned total number of trainees. These drop-outs had to be replaced by new recruits under new agreements.

The training expenses were relatively small, because the training was of a practical nature and was carried on in places where use was made predominantly of already existing accommodation and social and cultural facilities.

Another reason for these relatively low costs was that only in the case of the engineers, technicians and part of the skilled workers was training carried out with the trainee acting entirely as a supernumerary, since a considerable proportion of the other trainees, on account of the shortage of labour in the

factories where they were being trained, carried out their duties directly on the shop floor, and where this was the case the new steelworks which was being constructed was not billed with their wages.

Analysis of financial expenditures on the preparation and training of the workers

Preparation and training

The costs incurred in respect of each student for a course at a higher educational institution amounted, in the case of the new steelworks in question, to about 80,000 Korunas. This figure is not altogether comprehensive, however, as it covers only direct expenditures. If we take into account the fact that further expenditures are incurred in respect of the benefits made available to all citizens under the Socialist system, such as free medical care, paid holidays, sickness insurance, free use of the equipment and facilities of the higher educational institutions, and so on, then this means that the actual costs are higher, although it is not possible to calculate them accurately without a careful analysis. We simply wish to observe that foreign students also benefit in the same manner from all these advantages which our society provides for students throughout their whole course of study and preparation.

As far as the expenditure on the training of workers for a new iron and steel works is concerned, it must be stressed that the figures given above were for one specific instance in our country, which was affected by the fact that, because of the general level of the workers, it was only necessary to give a shorter period of training that would have to be envisaged if such training were given in a country which had hitherto been without an iron and steel industry. Thus, it is essential to evaluate and judge each specific case individually.

The evaluation of economic effect is of course a specific matter for an individual country, particularly one building an iron and steel works. Therefore we will not try to calculate this effect, as the result would not be applicable in different economic areas, but we will draw attention to several factors of general applicability which must be taken into account when determining the number of workers to be sent for instruction and the length of their training.

These factors are as follows:

- The equipment is of great financial value;
- It is of high technical complexity and calls for operation by skilled personnel;
- The equipment is new and unfamiliar to the area where the factory is being set up;
- It has a high output, with large material and financial turnover;
- Even short stoppages of the equipment mean large production losses.

These are just some points to be borne in mind when determining the length of training.

If we compare the expenditures relative to the case selected and demonstrated in the foregoing paragraphs, it can be observed that direct expenditure on the training of workers came to about 0.5 per cent of the total capital investments in the construction of the new iron and steel works and to approximately 25 per cent of the total annual payroll of the steelworks after completion of the construction of the comprehensive metal production cycle of the first phase of building.

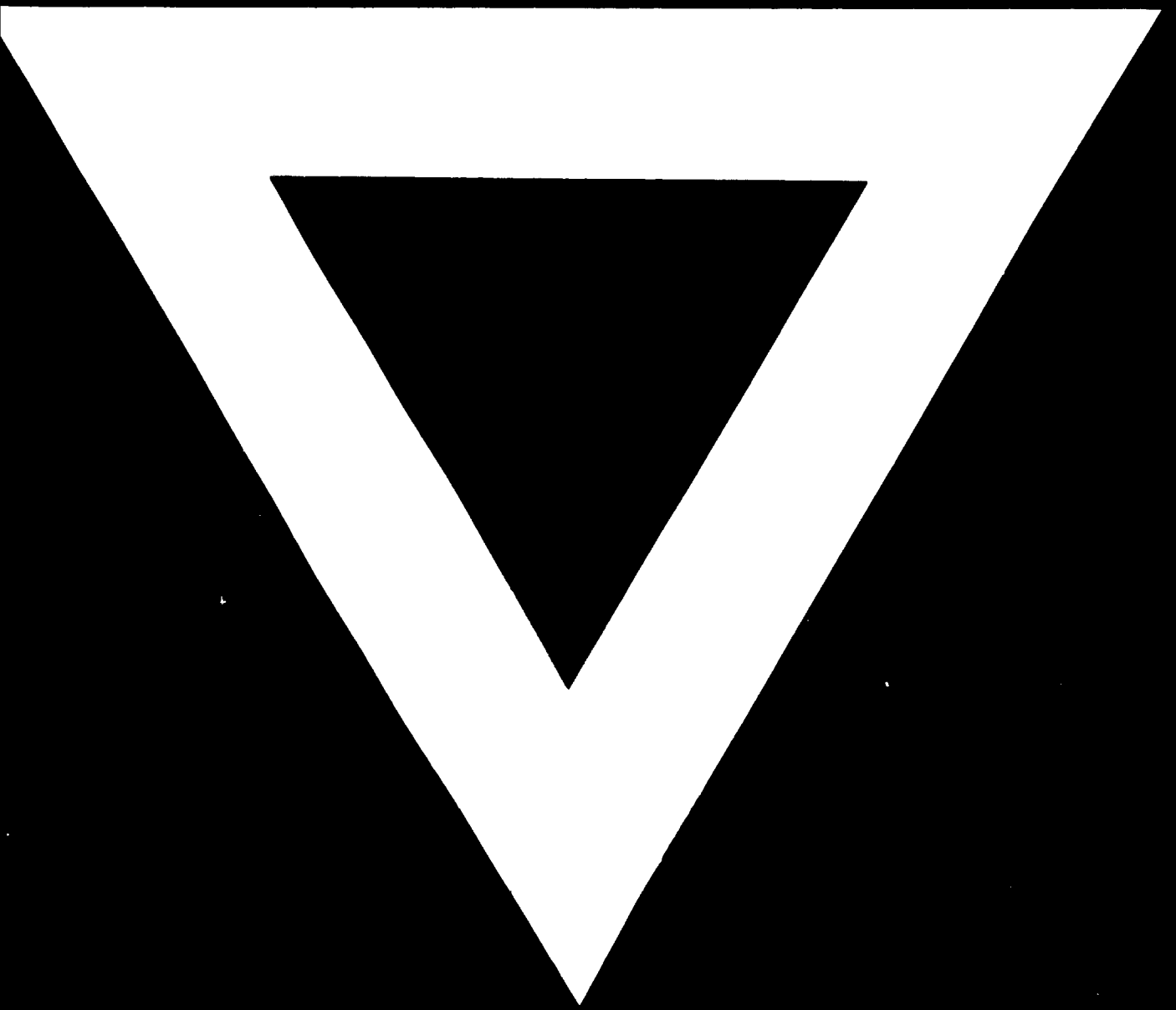
When we consider that by means of good training of the skilled key workers it is possible to cut down the length of time needed for the development of full production at the steelworks and cut down stoppages, it is easy to see that the better the initial training, the better the economic effect of this training on the new factory.

Conclusions

The considerations set forth above about the preparation and training of key workers for iron and steel works, particularly those being built in developing countries, may be of general applicability. They may be used as general lines of approach, subject to modifications of their details to suit particular cases, which usually have special features according to the individual countries and areas to which they refer, and consequently differ in certain details from the principles set forth.

Ostrava, 20 April 1968.





74 . 10 . 15