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IN-PLANT GROUP TRAINING OF ENGINEERS FROM DEVELOPING
COUNTRIES IN THE FIELD OF NON-FERROUS METAL INDUSTRIES
IN YUGOSLAVIA

by

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The views and opinions expressed in this paper are those of the consultants and do not necessarily reflect the views of the Secretariat of UNIDO.

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I.

INTRODUCTION

Lagging of economic development in the developing countries represents one of the essential characteristics of the post-war development of contemporary world. Most recent statistics indicate that not only unfavourable trends in economies of the most of developing countries were not stopped but also that they were proved once again. In the latest years there was a firm tendency of slower pace of economic development among these countries - the rate of growth of their gross product in the period 1960-1965 was about 4 per cent compared to 4½ per cent during the preceding five year period. The share of developing countries in world industrial production is stagnant at the level slightly exceeding 6 per cent. In 1965 agricultural production per head in developing countries was one per cent lower and food production three per cent lower than the corresponding figures for 1960.

Given the differences in rate of population growth, it is understandable why these unfavourable tendencies in production of developing countries lead to further widening the gap in the level of income between developed and underdeveloped parts of the world. According to Prebisch's estimates the gross product in developing countries was in 1965 142 dollars, exceeding the level for 1960 for 10 dollars. In the same period, the gross product per head increased in developed countries for 300 dollars, i.e. from 1.400 to 1.700 dollars. This is to say that in developing countries production per head was increasing at the annual rate of 2 dollars, while the corresponding figure for developed countries was 60 dollars. During the first half of "Development Decade" gross product per head in developing countries increased at the annual rate of 1.5 per cent compared to about 4 per cent for developed countries, which indicates, for itself, what will be final outcome of the "Decade". Rapid trend of technical progress, together with ever increasing role of investment equipment, in industrially developed countries evidently indicate perspectives of considerable enlargement of national wealth of the developed world with simultaneously difficult way of developing countries to implement plans of their social and economic development.

United Nations Organization as well as other international organizations contributed significantly to identification of economic and social problems in developing countries. Developing countries possess enormous natural resources which are utilized at the minimum degree though they represent potential sources for accelerated development not only of developing countries but of the whole world as well.

National economic development plans of developing countries as well as all international programmes of assistance for those countries

give the particular attention to industrial development of those countries. With its Resolution 2152 (XXI) the General Assembly of United Nations Organization established the United Nations Industrial Development Organization, from which, by my opinion, both developed and underdeveloped world rightfully expect fulfilment of its programme tasks which will essentially contribute to more dynamic progress of developing countries.

Chapter II (VIII) of the Resolutin puts down that UNIDO should "extend the assistance to developing countries to train their professional and other relevant categories of personnel necessary for their fastest possible industrial development"

Yugoslavia considers that the UNIDO goals could be achieved only by unreserved engagement of all member countries of the world organization. From our own experience in industrial development we got to know that the skilled personnel represent propelling force of social development and productional processes. There is nothing more important in industrial development than the personnel in process of their growth, where they acquire knowledge, skills and ability. In economic terms this means creation of personnel "capital" which, being invested into productional process, propels material resources and creates social goods.

From the above stated, naturally, the attitude of Yugoslav Government to accept the idea of esteemed Mr. Abdel Rahman to organize six montas in-plant group training of engineers from developing countries in the field of non-ferrous metal industries. The training was held as from 1 November 1966 to 30 April 1967.

II.

YUGOSLAVIA AS THE HOST COUNTRY OF THE GROUP TRAINING

We think that Yugoslavia as the host country of the six months seminar in the field of non-ferrous metals under the auspices of UNIDO was able to offer to trainees not only possibilities to widen their theoretical knowledge but also, which to our opinion is of particular importance, to gain practical experience at all stages of planning, production and marketing of non-ferrous metals.

It is well known that Yugoslavia is one of the richest countries in Europe regarding the reserves of copper ore enabling it to produce about 110,000 tons of copper per year. The share of Yugoslavia in overall reserves of lead and zinc amounts to 6 per cent of world, namely about 20 per cent of total European reserves of lead, and about 4 per cent, namely 14 per cent of total European reserves of zinc. The share of Yugoslavia in total European reserves of bauxite is about 35 per cent while corresponding figure for the whole world is about 4 per cent. We should bear in mind that the total bauxite reserves in Yugoslavia are potentially considerably higher as they are not yet sufficiently explored.

It is doubtless that, from the aspect of raw material basis and power sources, Yugoslavia has very favourable conditions for development and processing of nearly all non-ferrous metals. All mines and plants producing non-ferrous metals, or being under way, introduce most modern technology of production on grounds of most recent world achievement in the field of this industry.

Yugoslav industry producing semi-products of non-ferrous metals gained, by exporting its products to all five continents, a great reputation at the world market. High quality of tin, pipes, rods, profiles and wire made out from copper, aluminum, lead and zinc, as well as their alloys, Yugoslav enterprises do achieve thanks, to modern equipment of productional units, rational work organization, and before all to relatively favourable professional structure of those employed.

Rapid industrialization represents fundamental component of economic development of Yugoslavia in the passed two decades (1947-1967). Rapid industrialization was proved in Yugoslavia as the efficient way of drawing the country out of backwardness, as a method of progressive shift in the structure of economy and population and raising work productivity. As the country which in less than two decades managed to convert a agricultural-extractive economy to an industrial one, Yugoslavia accumulated substantial experience in solving the problems and overcoming the difficulties which accompany industrialization.

Increase in industrial employment in Yugoslavia was carried out intensively both in terms of quantity and quality. Efforts invested into the system of education of personnel gave their yield. Qualificational structure of workers is permanently increasing though it did not yet reach the level of our requirements. Particularly important is the flow of personnel with university education, their employment in industry being 4.758 in 1953 compared to about 25.000 in 1965. Technical and economic personnel are particularly highly concentrated in industry, since ^{every} each third engineer and technician, and ^{every} each fifth economist are employed within industrial enterprises.

Educational level of managerial personnel in industry increased considerably, particularly technical one. This structure was improving permanently since the principle of re-election of personnel performing managerial functions makes it possible to more and more skilled and capable personnel to take over these posts.

Yugoslav industrial personnel are very young in average - about 66 per cent are below 35 years of age.

Over 5,000 young Yugoslav specialists were trained in industrially developed countries and a number of them submitted their M.A. theses and doctor dissertations.

All this justifies selection of my country as the host country for the group training. Transfer of our experience has been rightfully accepted as realistic and important objective of the seminar.

Aiming at the fullest possible success of the seminar the Yugoslav Government, in co-operation with UNIDO and UNDP representatives, provided considerable financial resources amounting about 80 million old dinars as well as the co-operation of the Mining-geological faculty, Belgrade, and largest metal processing enterprises in Yugoslavia.

III.

PROGRAMME OF THE GROUP TRAINING

The training programme embraced theoretical part, in-plant training and laboratory work.

1. Theoretical part covered prospect of development of non-ferrous metal industry, automation, standardization and survey of technical literature.

2. In-plant training in mines, and

3. In-plant training within factories, consisting of acquaintance with the following processes:

- copper smelting and refining (including electrolysis);
- zinc and lead smelting and refining (including electrolysis);
- use of waste gases from non-ferrous metals smelting plants;
- copper processing;
- rolling and forming of copper and copper alloys;
- zinc and lead processing;
- study of machines, their operation and maintenance used in the non-ferrous metal processing industry;
- management and organization of non-ferrous metal plants;
- production planning and control, cost control, purchasing and stock control, industrial relations, personnel and training, industrial safety.

4. Laboratory work in quality control and material testing and controls.

5. For trainees particularly interested in ore processing, smelting, and refining, special laboratory and semi-scale pilot plant training was organized.

6. A 14-day visit to non-ferrous plants and factories providing equipment for non-ferrous metal industries was organized for all trainees.

7. Closing remarks on the programme and instructions for writing the reports.

Thirty candidates were registered but only 18 came from the following countries:

- | | |
|-----------|---|
| - Poland | 3 |
| - Romania | 3 |
| - Chile | 2 |

- Columbia	1
- Tunisia	1
- UAR	5
- Venezuela	2
- Iran	1

Group training commenced at Belgrade on 2 November 1966.

IV.

IMPLEMENTATION OF THE GROUP TRAINING PROGRAMME

Federal Administration for International Technical co-operation entrusted implementation of the group training to University of Belgrade - Mining-geological Faculty - which provided lecturers for theoretical part of the training and, in co-operation with the Mining Institute, work in laboratories.

All lectures were published in English in due time and distributed among trainees immediately after arrival in Belgrade.

Theoretical part of the training was divided into two groups: mining and metallurgical.

Teaching for the mining group, consisting of 5 trainees, covered the following subjects:

1. Metaliferrous mining, mine development, and maintenance of mining equipment.
2. Underground and surface mining methods.
3. Ore-dressing of non-ferrous minerals.
4. Economics, organization and management in non-ferrous metal industries.

5. Automation in mining.
6. Safety in non-ferrous industries.

Metallurgical group, consisting of 13 trainees, covered the following subjects:

1. Metallurgy of copper, lead, zinc, antimony and mercury.
2. Non-ferrous metals processing.
3. Automation in non-ferrous metal industries.
4. Safety in non-ferrous industries, and
5. New trends in the development of non-ferrous metallurgy.

Theoretical part of training lasted 75 days in each group.

Practical part of training lasted three months and was carried out in the following mining-metallurgical enterprises:

- Mining Combinat - Bor,
- Mining-metallurgical-chemical Combinat of lead and zinc - Trepča,
- Rolling plant of copper and copper products - Sevojno,
- Wires plant - Svetozarevo,
- Mines of bauxite - Mostar and Drniš,
- Aluminium smelting and rolling plant - Ražine, Šibenik,
- Light metals plant - Šibenik
- Engines factory - Rakovica,
- Mines and smeltery of antimony - Zaječar,
- Coal mines - Kolubara, and
- Mining Institute - Zemun.

In the month of April a visit was organized, for all trainees, to following major enterprises producing equipment for non-ferrous metal industries, or their productional process was of the interest for trainees:

- Radio industry - Niš,
- Steel plant - Skopje,
- Smeltery of ferro-alloys - Tetovo
- Electro-engines factory "Rade Končar" - Zagreb,
- Light metals Institute - Zagreb,
- Foundry - Maribor,
- Aluminium smeltery "Por's Kidrič",
- Aluminium rolling plant "Inpol" - Slovenska Bistrica,
- Zinc plant - Celje,
- Lead and zinc smeltery - Nežice,
- Steel plant - Jesenice,
- Metallurgical Combinat - Litostroj,
- Mercury mines and smeltery - Idrija.

At the end of this professional excursion all trainees visited the Adriatic Coast from Rijeka to Dubrovnik, and on their way back to Belgrade also visited Sarajevo - capital of Republic Bosnia and Herzegovina.

Upon arrival in Belgrade the Federal Administration for International Technical Co-operation organized a discussion between trainees and lecturers. Short summary of this discussion is presented below.

1. All trainees estimated both theoretical and practical parts of the training as extremely profitable for their further successful work in non-ferrous metal industries.

2. The wish was expressed by all trainees to organize, if possible, the group training of engineers in the field of non-ferrous metal industries every second year, with the increased number of trainees since all necessary conditions exist, and, before all, the interest of developing countries for improvement of non-ferrous metal industries.

3. The organizers proposed to supplement the following group training programme with a visit to one of European countries having developed non-ferrous metal industries, enabling in such a way to trainees to get acquainted with technical and technological achievements, organization of enterprises, planning etc. in the non-ferrous metal industries, of that country.

4. It was pointed out by all trainees that they gained much more than they expected from all elements of the group training programme.

5. Trainees expressed their gratitude to the organizers not only from the aspect of contents of training and its implementation but also for its full understanding of all their requests.

6. Lecturers expressed their satisfaction that they, by their work, contributed to accomplishment of goals of the United Nations Industrial Development Organization.

7. All lecturers judged very favourably the interest and efforts of each participant in the training.

It is our feeling that the seminar on non-ferrous metal industries fully affirmed the idea of group training and proved that such form of education and specialization of personnel from developing countries should be utilized on wider basis in the further work on this important task.

V.

SUGGESTIONS OF THE HOST COUNTRY

Speaking from the aspect of the host country of the group training we are so free as to make the following suggestions:

1. Knowing the needs and requirements of developing countries, UNIDO could produce the necessary number of group training programmes,

select the host country, with its consent of course, and define conditions and elements of group training. All these programmes would represent a medium-term plan of UNIDO activities on education of personnel from developing countries.

2. The form of group training provides the most appropriate transfer of scientific knowledge and its application in technics and technology of those treatments which substantially change from decade to decade doubling the level of production and of work productivity.

3. Trainees are in position to study, if necessary in smaller groups, to check their knowledge through discussion, to use equipment and laboratories, as well as particularly written and published lectures for each of the programme subjects. Practical work of trainees in factories and institutes is far more useful and efficient with presence of lecturers and their day-to-day assistance, which is possible to provide only by the form of group training.

4. The host country as the organizer of group training may:

- entrust in due course the carry out of group training to most competent institution in corresponding field, which will provide lecturing staff, relevant literature, equipment, laboratories, practical work in enterprises etc.;

- prepare, print and translate texts of lectures;
- prepare visit to one of the countries, in accordance with wishes of trainees and in agreement with UNIDO, so that the trainees could compare knowledge acquired through theoretical and practical parts of training with achievements in that country.

5. Apart from the report, the organizer of group training might submit to all interested countries and organizations texts of the lectures held and details on practical part of training.

6. The area of group training offers most favourable possibilities for affirmation of humanistic vision of human personality striving to accomplish not only primary needs but also to get to know cultural and technical achievements of other nations - all of which contribute to better international understanding and co-operation.

7. Participants in the group training might in a qualified way assist plans of their governments to establish possible mutual co-operation in relevant field of industry, as for example:

- to identify fields of co-operation;
- in the field of joint organization of scientific-research work;
- possibilities of enlarging capacities through joint investments;
- acceptance of common standards for control of products quality etc.

8. The trainees can in a qualified way assist in selection of a consulting firm for elaboration of UNDP projects in their countries in this industrial field, as well as in providing equipment and possible sending to specialization of collaborators from their institutions.

VI.

ASSISTANCE OF UNIDO AND UNDP REPRESENTATIVE IN YUGOSLAVIA

UNDP Representative Office in Yugoslavia was in permanent contact with the Federal Administration for International Technical Co-operation and participants of the group training and this co-operation may be considered as exemplary one.

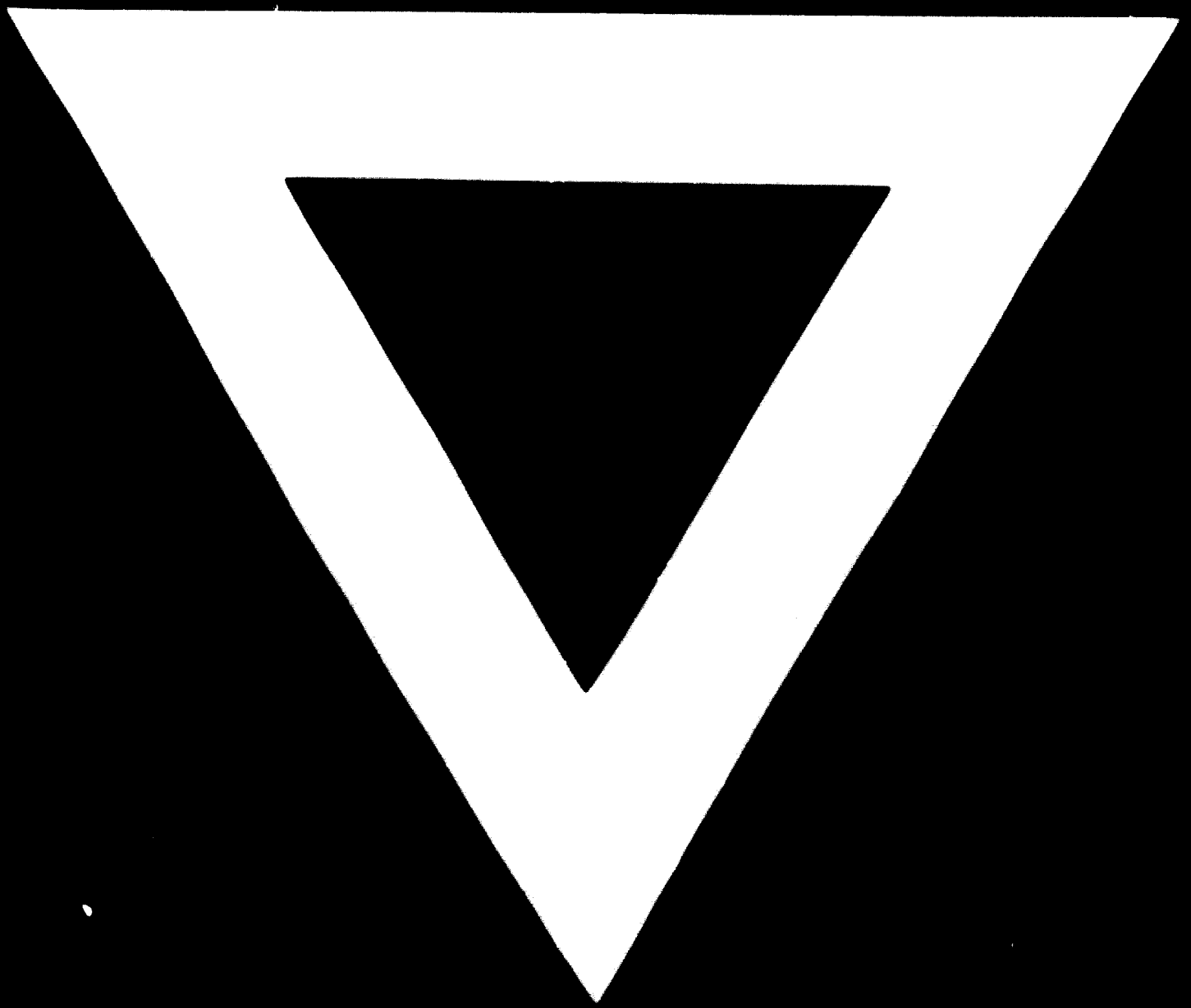
The assistance of UNIDO in organizing the group training may be considered a very precious one. UNIDO representative Mr. G.S.Gouri assisted the organizer of the group training considerably in the preparatory period,

while Mr. L.A. Idzkiewicz visited the organizer and trainees at the middle of programme implementation and lead the conversation with the organizer and trainees, contributing also to successful operation of training programme.

Belgrade, 22 September 1967.



We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche.



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