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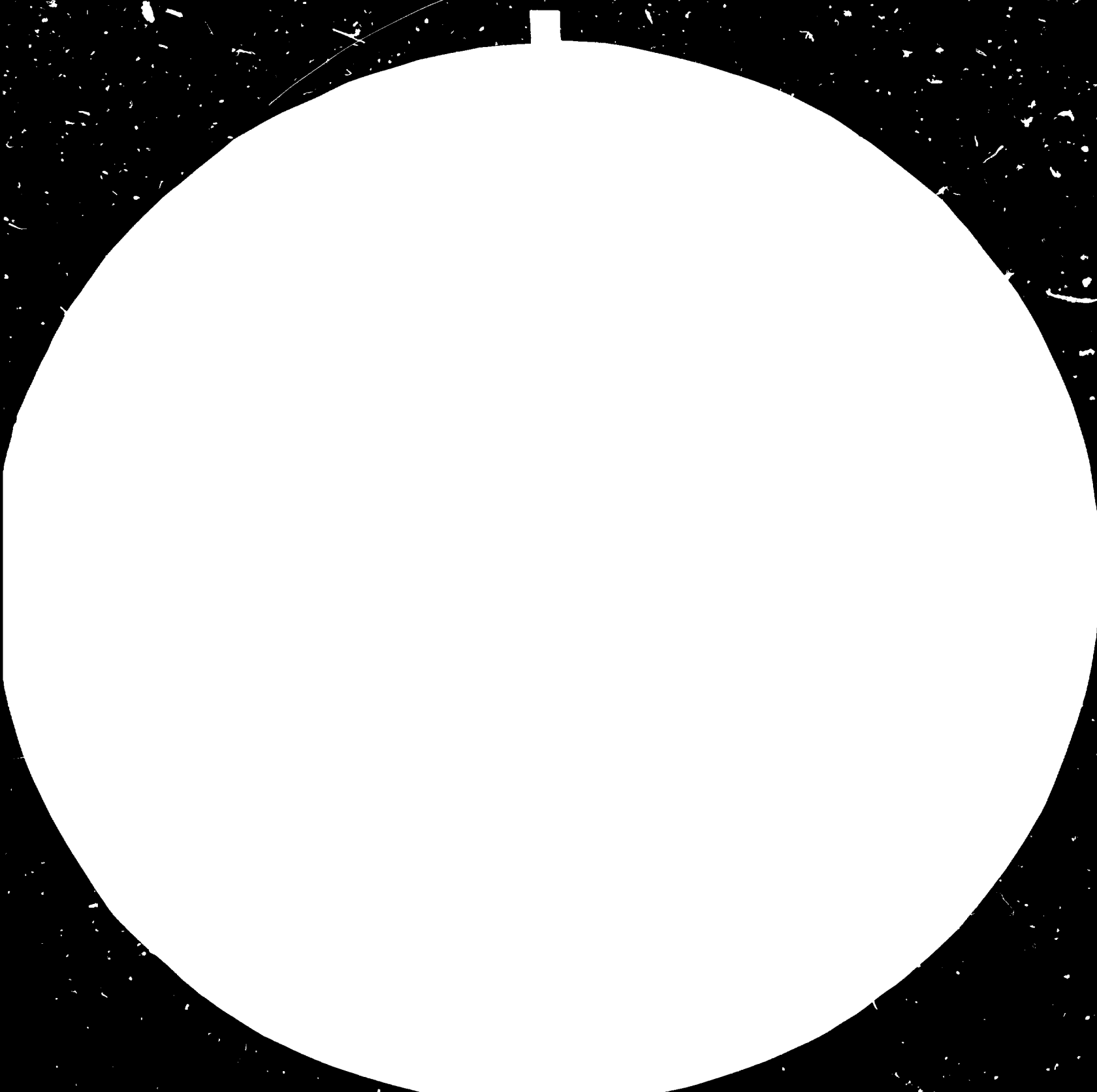

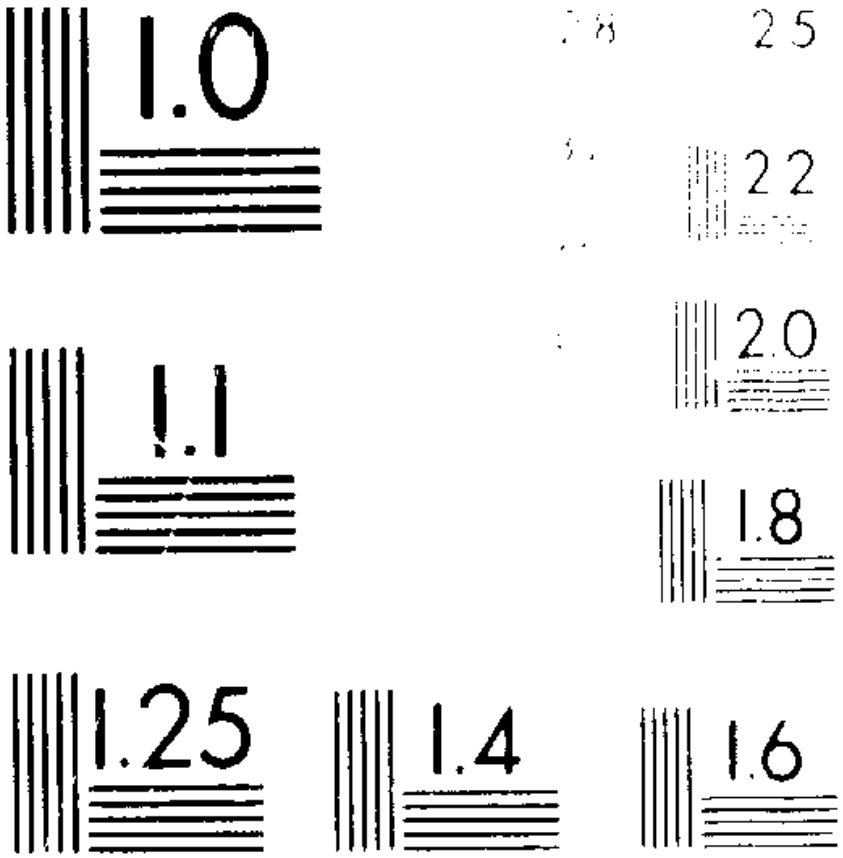
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REPORT TO UNIDO

ON THE CONSULTANCY WORK CARRIED OUT IN TITOGRAD.

17-21 SEPTEMBER 1984

IN THE CONTEXT OF THE PROJECT

DP/YUG/75/022

by Gyorgy Dobos
D.Sc M.A. Electrochemical Engineer

United Nations Industrial Development Organization

Vienna

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received from
M. T. WATANABE

Report to UNIDO on the Consultancy Work Carried out in Titograd: 17-21 September 1984 in the context of the Project DP/YUG/75/022

The author of this report was requested by UNIDO/PPRS to carry out in September 1984, a one week consultancy assignment in Titograd in order to assist the Project Director in the organization and management of the actual project activities. The relevant job description reflects those items which had to be considered during this assignment and processed according to the wishes of the Project Director.

1. Status of the Implementation of the Project:

When considering the subject matters to be examined with the participation of the consultant, the Project Director took into consideration the status of the implementation of the Project in 1984 which is, according to the information received from him,the following:

With the exception of the H_2 content tester and a relatively small part of the equipment indicated in the project document under electrical conductivity tester and measuring instruments for heat balance of pot, the equipments listed in the project document were ordered. An unexpected delay occured in the delivery of the X-ray and Texture Diffractometer is provoking further problems also in other project activities. Study tours scheduled for this year took place only partly. There will be also shifts from 1984 to 1985 in the realisation of expert missions to KAT. These delays of minor importance will presumably not influence the further successful implementation of the project and its completion for the scheduled deadline.

A saving of about US$ 30,000 appears in the equipment component of the project as a result of the operations already carried out or to be implemented until the end of this year.

The support offered by the KAT to the Aluminium Institute, namely the recruitment of staff, provision of services, office and laboratory space are being realised by the KAT according to the stipulations of the project document. The inland professional training of the staff follows also the pattern indicated in the project document.

Due to the above explained reasons, the equipment installation schedule indicated in the project document should be updated, the time schedule of the delivery of consultant services and study tours amended. It seems also advisable to start to program for 1985, the utilisation of the provisions in the project budget for additional consultancy services with a view to speed up the utilisation of the new research capabilities created or being developed in the Institute for the solution of practical technological problems of the KAT.

Having in mind the integrated character of the KAT operations (alumina, aluminium and semis) and the vicinity of the bauxite mines and the level of research capabilities to be achieved in 1985 in the Aluminium Institute, training activities for experts from developing countries in accordance with the stipulations of the project document could be envisaged by the UNIDO Secretariat in the near future.

2. Items selected by the Project Director for discussion during the Consultancy.

After appropriate discussion, the following items (in accordance with the Job Description) were selected by the Project Director for processing during the exercise:

a) Establishment of the amount of savings in the purchase of equipment;

b) urdating of the programme of project activities in 1985 and 1986;

c) preparation of additional job descriptions;

d) exchange of views on the further development of the Aluminium Institute on federal level;

e) offering training facilities for experts from developing countries.

3. Savings deriving from the Purchase of Equipment.

The following table contains a consolidated information covering the utilization of the budgets available for the purchase of equipment:

Table I

Status of the purchase of equipment
1000 US $

Denomination	Price according to proj. budget	Factual price	Difference +/- *	Remark
Thermobalance) Sedimentation) Screens) Diffractometer)	187	177	+10	Equipment ordered in 1982
Scanning Microscope	190	155	+35	Equipment ordered in 1984
Lab scale galvanization	13.5	39	-25.5	
Furnaces	25.0	12.3	+12.7	
Conductivity tester, Measuring Instruments	12.7	12.7		
Measuring Instruments	7.3	7.3	- 0 -	Equipment to be ordered in 1984
H_2 Content Tester	40.0	40	- 0 -	Equipment for which specification is needed.
Total	475.5	443.3	+32.2	

* + = saving - = over expenditure

From the table the following conclusion can be drawn:

a) Measuring instruments with a value of US$ 7300 should be urgently specified and ordered.

b) The Project Director has to present for the consideration of the forthcoming tripartite review proposals referring to the utilisation of the US $32,200 deriving from savings in the budget for purchase of equipment.

c) Action should be taken in order to finalize the order of the H_2 content tester.

4. Updating of the Programme of Project Activities for 1985 and 1986.

In the previous chapter, the estimation of the purchase of equipment for the project activities was illustrated. Table 2 shows the status of implementation of the expert component of the project.

Table 2

Status of Implementation of the Expert Component in 1984

Number of the post	Duration weeks	Implemented	Under recruitment for 1984 implementation	Under recruitment for 1985 implementation	Other
11-01	1 (2)	+ (1)			
11-02	2 (3)				+ *
11-58	2 (3)		+		
11-55	1	+			
11-56	1		+		
11-59	2			+	
11-57	2			+	
11-60	2			+	
Total	13	2	3	6	2

* For this post a considerable expansion of the activities will be suggested.

The considerable delay in implementation is related to the late delivery of equipment mainly that of the X-Ray and Texture Diffractometer. As soon as the delivery of equipment takes place, candidates for posts 11-59, 11-57 and 11-60 can be immediately fielded. For the posts included in Table 2, all the job descriptions are available, therefore urgent action is required in order to finalize the recruitment for posts 11-58 and 11-56. Consultancy services were scheduled for 1985 in order to assist the Aluminium Institute in the handling of the Scanning Microscope. The job description should be established for this exercise.

A careful review of the present activities of the Institute, and the possible consequences of the delayed installation of several important instruments led to the conclusion that the appropriate utilisation of the Additional Consultancy Fund earmarked in the Project Document - if necessary combined with other resources included in the Project Document or emerging for possible savings - should start already in 1985. This exercise could speed up the establishment of the work programme of the Institute with a possibly full and adequate use of the new research capabilities which have been or are being created with UNDP contribution. Practically the approach would be the following: in 1985, 1986 and 1987, yearly 2 - 4 high level consultants would be engaged for 2 - 6 weeks in addition to the consultancy services already scheduled. The profile of these consultants would correspond to the main activities of the KAT for which research using the new capabilities is being envisaged, e.g.: alumina production, electrolysis, casting, forging, extrusion, rolling, forming, welding, foil converting,

surface treatment, sintering, modelling of technological phenomena. The Project Director should carefully establish the subjects and the timing of these additional services having in mind, that the reception of 4 consultants in a given year seems to be the highest limit of the absorption capacity of the Aluminium Institute in the framework of the presently suggested Application Programme for the research capabilities being created.

The suggested additional consultancies could be organised according to the following tentative scheme: Information to be given by the consultant on the up to date trend in research concerning the activity under consideration; review by the consultant of the facilities of the KAT in technological equipment, processes; research facilities; identification of priority problems, the solution of which should be envisaged through laboratory/pilot scale research within the Institute; establishment of the relevant research programme involving all inter-disciplinary possibilities available in the Aluminium Institute and the KAT. It seems to be advisable to involve, in selected cases, via split missions, the consultants in the assessment of the results of the research activities. It is also suggested to invite representatives of other aluminium producers in Yugoslavia to participate in the proposed exercise.

According to the considered opinion of the drafter of this report, the approval by UNDP and UNIDO of the presented Application Programme of the Research Capabilities could considerably speed up the development of the Aluminium Institute in Titograd as well as the process of practical utilisation of the capabilities in research being created through the Project.

A tentative job description describing the duties of the alumina expert, to be involved in the suggested programme is attached (Annex I). It should be pointed out,as it was already indicated,that the suggested additional consultancy services do not duplicate the activities envisaged for posts 11-58, 11-56, 11-59, 11-57 and 11-60, which are conceived to help the Institute's staff to acquire the knowledge necessary for the manipulation of the project equipment and to interpret the results obtained. Only the job description for the post 11-02 should be amended according to the Annex I to present report.

In concluding one could state, that amalgamating the resources available for additional consultancy in the Project Budget with the savings appearing on the equipment component, it would be possible to finance 10-11 m/m of additional consultancy with a view to speed up the development of new capabilities in research in the Institute and the establishment of realistic and useful programmes of research for their effective utilisation.

Consequently, in addition to the posts indicated in Table 2, the following consultant posts are suggested for 1985:

- Consultant for the application of scanning microscope in aluminium industry research — 2 weeks
- Consultant in alumina technology and research* — 3 weeks
- Consultant in aluminium forging and extrusion technology and research* — 3 weeks
- Consultant in aluminium rolling and foil converting technology and research* — 3 weeks
- Consultant in organization and management of aluminium industry research. — 1 week

* Posts proposed in the framework of the suggested Application Programme for the research capabilities being created.

With the consultancy services indicated in Table 2 a total of 18 weeks appears what seems to be rather important. For this reason, it is suggested to shift the consultant for heat balance for 1986 and to request the consultancy services for the scanning microscope in split missions for 1985 and 1986. Concerning study tours, it seems to be highly advisable that the study tours proposed for 1984 and not implemented during this year, take place in 1985. Having in mind the successful implementation of the Training Programme in 1984, the relevant activities could follow in 1985 the indications of the Project Document.

5. Further Development of the Aluminium Institute on Federal Level.

It was already mentioned that the support provided by the KAT to the Aluminium Institute corresponds to the relevant commitments reflected in the Project Document. The construction of the new building facilities started, administrative and substantive measures foster the activities of the Institute. The actual staff of twelve persons (8 graduates) will be increased to reach till the end of 1984 eighteen (13 graduates). Initially, the final target for the staff of the Institute to be reached in 1990 was 44 (33 graduates) actually a figure of 70 (55 graduates) is being envisaged. Considering the possible needs in aluminium industry research on federal level, the present idea referring to the staffing of the Institute is more realistic.

The main activities actually being carried out by the Institute's staff are the following:

- training of the staff following the stipulations of the Project Document;
- qualification of production materials using the facilities for material science;
- development of methods for the qualification of production materials using material science;
- development of the technological process for the production of special forgings;
- assistance in the development of technology for the production of thin strips for canstock.

The description of these activities illustrates that the management of the Institute follows a sound policy combining the development of human resources, updating the methods of investigation and contributing on a systematically increasing level to the solution of technological problems of KAT.

The Project Manager gave information about the contacts he already established with the Aluminium Association of Yugoslavia and with representatives of different other aluminium producers in the country. He also mentioned that results of the research activities of the Institute will be made available to other aluminium producers through lectures in professional gatherings and publications. It was nevertheless felt by the drafter of this report, that an organized involvement of the members of Aluminium Association in the activities of the Institute has not yet been initiated. This is also due to the opinion prevailing in the Insti-

tute, that they have the intention to invite the other aluminium producers in Yugoslavia to get acquainted with the facilities of the Institute once the construction of the new building and the installation of the available equipment will be completed, namely at the end of this year. Nevertheless there are already two possibilities in order to speed up the participation of the members of the Aluminium Association in the work of the Institute:

- Initiate the establishment of technical advisory services for customers. Full details and justification of this proposal are explained in the previous report of the drafter on his mission to Titograd which took place on 14 - 19 November 1983. It is strongly recommended to include in the work programme of the project for 1985 the relevant study tour indicated in the quoted report. When organizing this study tour, it is suggested to devote special attention to the following issues:
  (a) in-plant training offered by the aluminium producers to the staff of the consumers;
  (b) issuance of special documents e.g., guidelines for design of aluminium constructions, for the processing of aluminium-semis, etc.;
  (c) support by the aluminium producers to the edition of technical publications, technical periodicals dealing with the problems of application of the metal with the clientele.
- Invite and involve the experts of other alumina, aluminium and semi producers in Yugoslavia in the exchange of views to be organized in 1985 in the Institute during the activities of

consultants to be engaged for: alumina technology and research; forging and extrusion technology and research; rolling and foil converting technology and research. The realization of this proposal would allow the experts of other Yugoslavian companies to get acquainted through the services of the Institute with modern research and development trends in the relevant industrial branches; to establish a constructive dialogue with the consultant and maybe to agree with Institute upon the joint solution of some of their problems.

6. Organization of Training Programmes for the technical staff from developing countries.

The conditions in KAT are outstanding for the organization of in-plant training for experts from developing countries. The plant is fully integrated: alumina, smelter, production of semis. Considering the vicinity of the mining operations in Niksic, the full cycle of the bauxite processing can be studied in Crna-Gora by the trainees. In addition, the production started in 1971, the technology and the equipment are up-to-date and the present level of the operations is an excellent example of the successful absorption of sophisticated technologies in an industrially relatively not advanced region. This experience could be very relevant for developing countries having the intention to create an aluminium industry or to update the technological level of existing operations. After the completion of the installation of the project equipment, the Aluminium Institute will also be able to demonstrate the application of up-to-date research methods to the solution of aluminium industry problems. The KAT management, in accordance with the stipulations of the Project Document, is ready to

consider proposals for the organization of different training programmes for experts from developing countries. It is also worth to mention that Titograd is very well equipped with hotels, the site of the city is attractive and the climate is mild.

7. Conclusions

The development of the Aluminium Institute since the preparation of the previous report of the drafter follows the scheme included in the Project Document. Attention should be devoted to compensate the effects of the delay in delivery of equipment. Through the suggested Application Programme for the Research Capabilities being created, the development of the activities of the Aluminium Institute could be strengthened and its activities on a federal level be initiated. The creation of Advisory Services for Customers merits the full attention of the Institute's Management.

8. Recommendations

For UNDP and UNIDO - to establish the work programme of the project for 1985 considering the proposals explained in the present Report.

- to agree to shift the savings on equipment component to project personnel with a view to launch the suggested Application Programme for Research Capabilities being created.
- to consider the involvement of KAT in the different training activities to be organized for experts of developing countries in the field of aluminium industry.

For the Project Director - to organize the project activities in 1985 considering the suggestions included in the present report in particular to involve the other aluminium producers in Yugoslavia in the activities related to the study tour on Advisory Services for Customers and to the exchange of views with high-level consultants envisaged in the framework of the Application Programme for Research Capabilities being created.

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The author of this report wishes to express his full appreciation to Mr. Branislav Radonjic, Director of the Aluminium Institute for the substantive and logistic support he received from him during his mission to Titograd, Yugoslavia.

UNITED NATIONS ANNEX I

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO 17 October 1984

PROJECT IN THE SOCIALIST FEDERAL REPUBLIC OF YUGOSLAVIA

JOB DESCRIPTION

DP/YUG/75/022/11- /31.8.A

Post title Expert in Alumina Technology and Research

Duration Six weeks

Date required Three weeks, second quarter 1985, three weeks, second quarter 1986.

Duty station Titograd (possible missions to other alumina plants in the country).

Purpose of project Establishing of an Aluminium Institute in Titograde.

Duties Under the supervision of the Project Director, the Consultant is expected to:

1) Get acquainted with the main characteristics of the technological process and the equipment being used in the KAT for alumina production.

2) Get acquainted with the methods and instruments available in the Aluminium Institute for the different types of analyses of bauxite and alumina and other products involved in the fabrication of alumina in the KAT.

3) Inform the engineersof the KAT and of the Aluminium Institute about modern research and development trends in the alumina industry.

4) On the basis of the above explained activities and in co-operation with the engineers of KAT and the Aluminium Institute, identify problems the solution of which might be envisaged through research to be carried out by the Institute. Establish priorities with due consideration to the economic effect of the solution of the problems under consideration and the investments necessary for the practical utilisation of the

..../..

findings of the research.

5) In co-operation with the engineers of the KAT and of the Institute, establish detailed programme of research activities for the solution of priority problems selected according to the criteria indicated in para 4.

6) Participate through split mission in the assessment of the progress of the research activities and -if appropriate- present suggestions for corrective action.

7) It is envisaged to invite experts from other alumina producing enterprises in Yugoslavia to listen to the information to be given by the consultant according to para 3 and he might be requested to visit other alumina plants in the country with a view to participate in the identification and formulation of alumina industry research programmes.

Qualifications: Advanced degree in chemistry or metallurgy. A minimum of 10 years of practical experience in alumina production and research.

Language: English, French and Russian an asset.

Background Information: During the last few decades, the country has made considerable efforts to develop its national aluminium industry. As a result, approximately 1.1 million tons of alumina and 300,000 tons of aluminium production capacities per year are currently available, placing the country among the most important aluminium-producing countries in Europe. The production of different types of semis is also considerable. The important bauxite deposits available and hydro-energy resources may justify the consideration at a later stage of a further development in the production of aluminium.

In this context, an Aluminium Institute has been founded within the Kombinat Aluminijuma Titograde (KAT) in order to further step-up well-selected technological capabilities in the aluminium industry through carrying out appropriate R+D activities.

The equipment and the methods available correspond to the over-all production structure of the KAT, i.e. alumina and anode factories, lime shop, smelter, foundry, rolling mill shop and processing factory.

The laboratory at present is able to carry out on a routine basis the following activities:

a) Chemical Methods: Gravimetry, volumetry, colorimetry, potentiometry, electrogravimetry, pH measurement, etc;

b) Optical Methods: Emission spectrometry, X-ray spectrometry, atomic absorption spectrometry, X-ray diffractometry;

c) Physical Methods: Density (real, apparent) and porosity, melting point and electro-conductivity;

d) Mechanical Methods: Hardness, strength and plasticity.

From this it may be seen that the KAT laboratory is highly equipped and its possibilities in different kinds of analysis are much broader than those of a normal plant-control laboratory.

However, some essential R+D capabilities are still lacking, particularly in modern material science, in modelling technological phenomena on different scales which are necessary for applied research.

New capabilities to be developed include:

a) Additional capabilities to allow a more precise qualification of different materials, such as bauxite, alumina, different semis, castings and forgings of aluminium and its alloys;

b) Modelling of technological phenomena, referring to the conditions of fabrication of sandy/flowery alumina, etc;

c) Modelling of a large laboratory and pilot plant, elaboration of new procedures and analytical methods as necessary;

d) Carrying out sectoral strategic analysis and planning and participation in the preparation of feasibility studies.