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**UNITED NATIONS INDUSTRIAL DEVELOPMENT
ORGANIZATION**



FINAL REPORT

**Workshop
on
Production and Application of Alumina Chemicals**

held in Bangalore, INDIA

(27 -30 October 1993)

fulfilled by ALUTERV-FKI Ltd

UNIDO Project No (DP/IND/88/015)

Substantive officer: T. Grof, UNIDO

**By
T. Kalman
Team leader
ALUTERV-FKI Ltd.,**

November, 1993.

FINAL REPORT

**Workshop
on
Production and Application of Alumina Chemicals**

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UNIDO Project No (DP/IND/88/015)

Post No: DP/IND/88/015/11-55 TO 11-59

This report comprises this title page, 9 pages of text and 8 Appendixes (I through VIII.)

**ALUTERV-FKI Ltd.
Budapest, Hungary
November, 1993.**

ABSTRACT

WORKSHOP ON PRODUCTION AND APPLICATIONS OF ALUMINA CHEMICALS

Posts No.: DP/IND/88/015/11-55 to 11-59/J 13207

Global objective:

To assist the primary alumina producers in formulating strategies for the development of production capacities for alumina chemicals.

Special objectives:

- disseminating information on world production and consumption, characterisation and application of speciality aluminas
- providing a forum for extensive discussion between the producers, consumers and R & D institutions with a view to characterising the world and Indian scenes

Duration: October 26-30, which includes

- October 26: Preparation for the Workshop
- October 27-29: Workshop
- October 30: Discussion, brief evaluation.

Background material provided to Indian alumina producers:

- Production oriented Workshop handout on Co-products and by-products of the Bayer Alumina Production 1991, Budapest
- Application oriented Workshop handout on Production and Applications of Alumina Chemicals 1993, India

CONCLUSIONS:

The subjects debated at the workshop included the reviewing of the world alumina chemicals production and their market; the present status of world alumina industry and the strategy of producing alumina chemicals; the main field of application, characteristics and market for aluminium trihydroxide, activated alumina, calcined sintered and fused alumina products.

The main conclusions of the workshop are as follows:

- both the production and application of alumina chemicals are in advanced state in the developed countries where the markets are oversupplied. Therefore, the chances of breaking into this market by a new producer are very limited
- the Indian scene can be characterized by:
 - ◆ Only INDAL produces alumina chemicals among the primary alumina producers, while the other three alumina plants are still at the consideration stage
 - ◆ the size of Indian market is not exactly known/explored
 - ◆ utilisation of the domestic production potential seems to be low
- an opportunity was provided for interaction between producer and user industries; the latter have raised some questions which need to be examined carefully.
- the Workshop basically fulfilled its role since:
 - ◆ it gave a detailed picture on the world production and market situation based on which it became possible to evaluate the Indian possibilities, too
 - ◆ a good base was provided for the alumina producers to form their strategy to produce alumina chemicals

RECOMMENDATIONS:

The policy makers of the Indian alumina plants should carefully investigate all questions relating to the production/application and market when they preparing their decisions to produce alumina chemicals. It is desirable to establish extensive interaction with the user industries to make the development and production activities meaningful.

INTRODUCTION

In the framework of project No. DP/IND/88/015, the Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC) is being set up at Nagpur by the Ministry of Mines, Government of India in collaboration with the United Nations Development Programme has, as one of its objectives, the development of special value added products. The Centre is being equipped with some sophisticated equipment for the production and characterisation of special alumina chemicals. It was, therefore, felt desirable that a workshop on this topic be organised with the following objectives:

- disseminating information on world production and consumption, characterisation and applications of special alumina chemicals
- providing a forum for extensive discussion between the producers, consumers and R & D and academic institutions with a view to characterising the present Indian scene and
- formulating a joint programme of co-operation between the producers, consumers, research and academic institutions.

In order to provide information to the participants on the current status, the Centre had sought the co-operation of the United Nations Industrial Development Organisation (UNIDO) to organise a Workshop on the production and application of alumina chemicals in Bangalore, India in October, 1993.

The duration of Workshop: 5 days.

Based on the above the UNIDO and ALUTERV-FKI Ltd. signed a Letter of Agreement for Reimbursable Loan with the provisions of 5 Special Service Agreement No.:

DP/IND/88/015/11-55 to 11-59

Since the Job Descriptions are very similar to each other only one of them is attached as **Appendix I.** according to which the followings are to be completed:

- to prepare a Workshop handout, and
- to present lectures and provide consultancy during the Workshop.

The Workshop handout was prepared by the authors named in the Job Descriptions and by co-authors/see **Appendix II.** by the end of August, 1993 and submitted to UNIDO, Vienna and JNARDDC, Nagpur where the Centre made it copied for the participants of the Workshop.

The Workshop handout consist of five chapters (140 pages), 3 Annexes (45 pages) and containing 44 figures, 57 tables and more than 70 references.

The Content of Handout is shown in **Appendix III**.

Due to some organisation difficulties, the project management had to change the programme resulting in the followings:

- the time for panel discussions was shortened by additional lectures by Dr. K. Evans, ALCAN and representatives of Indian firms
- because of these changes the final programme of the Workshop could be fixed on site on 26th November only featuring by the followings:
 - October 26 Programme modification
 - October 27-29 Workshop
 - October 30 Consultation, evaluation of Workshop

The final Workshop programme is given in **Appendix IV**.

The selection/invitation of Indian participants were organised by JNARDDC with the assistance of Dr. J. Zambo CTA, UNIDO. As a result of this activity 42 participants from various relevant areas attended the Workshop. The list of participants is shown in **Appendix V**.

IMPLEMENTATION OF THE WORKSHOP

The Workshop programme consisted of the following parts:

- Lectures - These were given by the ALUTERV-FKI Ltd., experts, Dr. T. Kalman, Dr. L. Gillemot, Dr. M. Toth, Dr. K. Nagy, Mr. Z. Balogh and also Dr. K. Solymar. The lectures were focused on the application possibilities where the specialty aluminas found extensive use mainly in the developed countries.

- Consultation - Each lecture was followed by a short informal discussion on the given subject.
The lecturers also ensured possibility to discuss questions raised at the end of each working day as well as on 30th November, 1993.

- Social events - The working lunches, welcome party were also the forums to exchange technical views and discuss questions/problems of common interest.

During the Workshop, modified self-evaluation forms **Appendix VI.** of UNIDO'S Group Training Programme Evaluation were distributed and requested to fill them in by the participants.

The Workshop programme performed is evaluated on the following point of views:

1. Evaluation based on the opinions of participants by filling in the evaluation forms.

The received 25 filled in forms were evaluated and summarized out of which the main issues are given below in the same sequence as of the file numbering

1.) Program content and organisation

- 1.) The total duration of the Workshop was estimated mostly just right (15), but a lot of participants mostly of INDAL suggest shorter one.
- 2.) The daily schedule was find by 12 % of the participants (3) too heavy and by others (22) just right.
- 3.) Lot of participants suggested to deal more with the technological problems.
- 4.) In general the training corresponded to the professional needs, but the distribution of the opinions is very wide.
- 5.) The general level of the training was found as adequate (19 from 25) and only 3 participants evaluated it as too low and 1 much to low and in spite of them 2 stated that it too high. This shows the very great differences in experience of participants in this field.
- 6.-7.) The subjects mentioned as most valuable and least valuable topics are listed in **Appendix VII**. The reason mentioned most frequently that the given subject was relevant or irrelevant for the person.
- 8.) Majority of participants mentioned the technologies of speciality alumina as relevant subjects which were not adequately covered in the program.
- 9.) Relating to the lectures 10 participants do not wish changes, 1 of them wish more, 5 wish less lectures. Some of them needs more group work (panel discussion).
- 10.) The general standards of the instructors relating to command of English was found very good by 1 participant, rather good 6, fair by 13 and poor by 5. The opinions relating to the method of instructions were better (very good 3, rather good 10, fair 9 and poor 3). In general the average standards of instructors can be evaluated as adequate.

- 11.) The common opinion of the participants (with 5 - 5 exceptions only) that they have sufficient time for professional exchange of views both with the program staff and fellow participants.
- 12.) The benefit of the exchanges of views with the program staff was evaluated a great deal by 3, much 11, somewhat 6 and little by 5 of participants. Less effective was the exchanges of view with fellows participants (great deal 3, much 7, somewhat 10 and little 5).

II. Relevance and applicability

- 13.) It was found that the contents of the program was relevant to the connections in the company/institute of the participants to a very good extent at 3, to a great extent at 7, to a sufficient extent at 9 small extent at 5, and to a very small extent 1 participant according to their special interest (job) and the expected development in the related fields at their companies (institutes).
- 14.) Majority of the participants evaluated the Workshop program point of view of their professional benefit useful (to a very great extent 3, to great extent 6, to a sufficient extent 8) but some of them was not satisfied (to a small extent 1 and to a very small extent 1)..
- 15.) Similar opinion was expressed relating to the opportunity to apply the newly acquired knowledge and experience in the present job of the participants.
- 16.) The participants declared that they are in position to transfer the newly acquired knowledge to others in their home country (to a very great extent 3, to great extent 3, to a sufficient extent 11, to a small extent 5 and to a very small extent 3).
- 17.) This transfer will be done mostly in a day-to-day work to colleagues and subordinates.

III. Main findings/recommendations of the participants (summarising)

The training was corresponding to a sufficient extent to their professional needs, the general level was estimated as an adequate one, the general standards of instructions were found rather good, the contents of the program was evaluated as relevant to conditions to a great or at least sufficient extent. It was also a common opinion that the total duration of the program was just right and the participants had sufficient time for professional exchange of views with the staff.

The Workshop should be much more concentrated to the technological aspects, the quality control (assurance) and environmental protection.

Plant visits should be organised according to the special interest and possibilities. More time to spend with plant visits where detailed information are requested. Sight-seeing of user industries should be included.

Small groups should be formed for the group works and more group works (panel discussion) should be organised.

Higher level of participation from end-users would have brought on the development needs.

Participation/presentation by University Scholars, dealing on related matters, would have helped bringing industry closer to Institutes.

Agents for sophisticated instruments for Quality Assurance, as needed to support activities in this business, could furnish cost data, maintenance contracts, etc. for the prospective entrepreneurs to acquire relevant information.

Some presentation could have been given by Indian Institute of Science.

Programme staff members can be taken to the bauxite rich states. Existing value-added projects of bauxite can be shown to them for the expansion, diversification and modification.

Visits to the consumer industry where the meeting of seller and buyer can be arranged.

Production technology and services rendered may be published in the house journal of the centre (JNARDDC).

Monthly Home Bulletin" may be published by the JNARDDC, Nagpur.

All special alumina chemicals price tariffs, with CIF 'value' can be compiled from companies and published in the suggested Bulletin.

There should have been some visit to plants using aluminium chemicals around Bangalore.

Such Programmes of training related to aluminium and aluminium products should be organised.

The workshop should highlighted some aspects of preparation methods along with equipment selection for such methods based on their commercial experiences.

Also the addresses of such equipment manufacturer was not covered.

2. Evaluation by the team of ALUTERV-FKI's lecturers

The Workshop basically fulfilled its role since:

- it gave a detailed picture on the world production and market situation based on which the Indian possibilities can also be evaluated/framed
- a good base was provided for the alumina producers to form their strategy to produce alumina chemicals
- a platform was provided for both alumina producers and end users where they could exchange the crucially important technical views of the two closely connected industrial areas.

The final conclusions/recommendation of the Workshop is given in **Appendix VIII**, which were prepared at the site by the representatives of the ALUTERV-FKI's team, Dr. T. Kalman, UNIDO, Dr. J. Zambo CTA and JNARDDC, Dr. T. R. Ramachandran, NPD.

25th November, 1993.



Dr. T. Kalman
ALUTERV-FKI Ltd.

Team leader

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION¹⁾

DP/IND/88/015/11-55

Post Title: Expert in Markets of Special Aluminas
Duration: One month (three weeks at home base, one week in Bangalore)

Date required: August 1993

Duty Station: Homebase and travel to Bangalore, India

Purpose of project:

The immediate objective of the project is to assist the Government of India in setting up a functioning Aluminium Research, Development and Design Centre consisting of:

- a) Alumina Production Research Department
- b) Aluminium Electrolysis Department
- c) Analytical Research Department
- d) General Services, instrumentation and Control Department (incl. Workshop and Maintenance)
- e) General Administration and Finance Department

The Centre will develop capability of carrying out the following main functions on behalf of and in co-operation with the bauxite processing/alumina production and aluminium smelter industries in the country:

- a) Assimilation and adaptation of available technologies
- b) Providing recommendations and ad hoc or applied and analytical research to local industries in process improvement, transfer of technology, etc.
- c) Setting up and operating a data bank
- d) Providing training of Indian engineers

Five experts (Position 11-55 to 11-59) are required by the Jawaharlal Nehru Aluminium Research Development and Design Centre Nagpur for organising a Workshop on Production and Application of Alumina Chemicals. The Workshop is expected to be held in Bangalore in October 1993.

The experts are required for conducting a five

Applications and communications regarding this Job Description should be sent to:

Project Personnel Recruitment Section, Industrial Operations Division
UNIDO, Vienna International Centre, P.O. Box 300, Vienna/Austria

- 2 -

day workshop in Bangalore, India for participants from R & D institutions and prepare written notes for circulation to the participants in the Workshop by August 1993 to facilitate editing and reproduction by the Centre.

The Workshop is expected to be of one week duration. A set of lectures of 80 minutes duration are to be presented mainly in the mornings covering the five major areas and the afternoons will be devoted to practical sessions/discussions. The written Workshop materials should include the following topics:

Production and Application of Alumina Chemicals

1. World production and market of specialty aluminas
 - Present production and forecast
 - Main products and development trends
2. Main strategies to produce specialty alumina chemicals
 - Co-production of smelter grade alumina and alumina chemicals
 - Conversion of the smelter grade alumina production into specialty one
3. Characteristics, main fields of application and market of aluminium-trihydrate
 - Direct application as filler/flame retardant filler
 - Raw materials for chemical industry (aluminium-sulphate, aluminium-flouride and cryolite, zeolite)
4. Characteristics, main fields of application and market of transition (activated) aluminium-oxides
 - Desiccants
 - Selective adsorbents
 - Catalyst-carriers
5. Characteristics, main fields of application and market of calcined, sintered and fused aluminas
 - Ceramic aluminas
 - Tabular aluminas
 - Calcium-aluminate cements
 - Fused products (abrasives, refractory materials)

JOB DESCRIPTIONS

(ABSTRACT)

DP/IND/88/015/11-56

Expert in activated aluminas
Dr. T. Kalman

DP/IND/88/015/11-57

Expert in aluminium trihydroxide
Mr. Z. Balogh

DP/IND/88/015/11-58

Expert in calcined and sintered aluminas
Ms. M. Toth

DP/IND/88/015/11-59

Expert in fused aluminas
Dr. K. Nagy

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Mr. Zoltán BALOGH, Dipl. Ing.

Head of Department
Ajka Aluminium Industrial Ltd.

Graduated at Inorganic Technologies Dep. of Veszprém University (Hungary) as a chemical engineer in 1980. He has been the leader of the Products' Development Dep. at Hungalu Ajka Aluminium Industrial Co., Ltd. He is responsible for the development of new products and procedures connecting with the alumina industry.

Mr. Tibor Ferenczi, Dipl. Ing.

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Mrs. Éva HIDVÉGI, BSc, MSc, PhD.

Head of Information Centre
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MOTIM

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Graduated at Veszprém University (Hungary) as a chemical engineer and at Budapest University as an economist. He has taken part in development of line process control system and new technologies for the alumina industry. At present he is the director of Alumina Branch in Ajka Aluminiumindustrial Co., Ltd.

Mr. Károly SOLYMÁR, BSc, PhD.

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ALUTERV-FKI Ltd.

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ALUTERV-FKI Ltd

Completed his studies at the Budapest Eötvös Lóránd University (ELTE) as chemist. Main fields of research activity: decreasing of caustic soda losses in Bayer-process, removal of different impurities from Bayer-process, precipitation of coarse alumina hydrate, special alumina production, technological evaluation of bauxites.

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WORKSHOP ON PRODUCTION AND APPLICATIONS OF SPECIAL
ALUMINA CHEMICALS

PROGRAMME

Wednesday October 27, 1993

- 08.00 - 09.00 Registration
09.00 - 09.45 Inauguration
09.45 - 11.00 L. Gillemot, ALUTERV-FKI, World production and
market of speciality aluminas
11.00 - 11.30 Tea break
11.30 - 12.45 K. Solymar, ALUTERV-FKI, Main strategy to produce
special alumina chemicals
12.45 - 14.00 Lunch break
14.00 - 15.15 Z. Balogh, Ajka Aluminium Industrial Ltd.,
Characterisation and direct applications as filler/flame
retardant filler of alumina trihydrate - market situation
15.15 - 15.45 Presentation from HINDALCO
15.45 - 16.15 Tea break
16.15 - 17.30 Z. Balogh, Ajka Aluminium Industrial Ltd., Alumina
chemicals - alumina trihydrate as raw material for
chemical industry (aluminium sulphate, aluminium
fluoride, cryolite and zeolite) - characteristics, main
fields of applications and market for related products

Thursday October 28, 1993

- 09.00 - 10.30 K. Evans, ALCAN Chemicals, Introduction to special
alumina chemical business
10.30 - 11.15 Presentation from INDAL
11.15 - 11.35 Tea break
11.35 - 12.50 T. Kalman, ALUTERV-FKI, Characteristics, main
fields of application and market for activated
aluminium oxides
12.50 - 14.00 Lunch break
14.00 - 15.15 M. Toth, ALOXID Ltd., Characteristics, main fields
of applications and market for ceramic aluminas
15.15 - 15.45 Presentation from Ceramic Research Institute
15.45 - 16.15 Tea break
16.15 - 17.30 M. Toth, ALOXID Ltd., Characteristics, main fields
of applications and market for tabular aluminas and
calcium aluminate cement

Friday October 29, 1993

- 9.00 - 10.15 K. Nagy, MOTIM, Characteristics, main fields of applications and market for fused products (abrasives and refractories)
- 10.15 - 10.45 Presentation from Widia
- 10.45 - 11.05 Tea break
- 11.05 - 11.35 Presentation from Grindwell -Norton
- 11.35 - 12.05 Presentation from Carborundum Universal
- 12.05 - 12.35 Presentation from JNARDDC
- 12.35 - 14.00 Lunch break
- 14.00 - 15.45 Panel discussion
- 15.45 - 16.15 Tea break
- 16.15 - 17.00 Valedictory function

THE INTERNATIONAL EXPERTS WOULD BE AVAILABLE FOR DISCUSSION WITH PARTICIPANTS ON SATURDAY OCTOBER 30, 1993.

WORKSHOP ON PRODUCTION AND APPLICATIONS OF ALUMINIUM
CHEMICALS
OCTOBER 1993 BANGALORE

LIST OF PARTICIPANTS

Sl.No.	Name	Organisation
01	Prof. K.P. Abraham	Aluminium Association of India Bangalore 560 012
02	Mr.P. Ashwadhama	Larsen and Toubro Ltd., L & T House, Ballard Estate Bombay 400 038
03	Dr.G. Balasubramanian	Jawaharlal Nehru Aluminium Research Development and Design Centre Nagpur 44C 013
04	Mr. S. Balchandani	Indian Rayon & Industries Ltd., 309, World Trade Centre, B. K. Rd., New Delhi
05	Mr. P.K. Basu	Indian Aluminium Company Ltd., Calcutta 700 071
06	Mr. A.N. Banerjee	Indian Aluminium Company Ltd., Calcutta 700 071
07	Mr. Y.I. Baxamoussa	Navin Fluorine Ltd., Mafatlal Centre , Nariman point, Bombay 400 021
08	Mr. J.V. Phat	Industrial Extension Bureau, Ahmedabad 380 009
09	Dr. B.K. Chandrasekhar	Ceramic Technological Institute, Bharat Heavy Electricals Ltd., Bangalore 560 012
10	Mr. R. Choudhary	Indian Aluminium Company Ltd., Calcutta 700 071
11	Dr. K. Choudhry	HINDALCO Industries Ltd., P.O.Renukoot , Distt:Sonebhadra (U.P.) 231 217
12	Mr. R. S. Dhulked	Indian Aluminium Company Ltd., Belgaum 590 010
13	Mr. T. Evans	ALCAN Chemicals Ltd., Gerrards Cross Bucks. England
14	Mr. R.N. Goyai	Jawaharlal Nehru Aluminium Research Development and Design centre, Nagpur 440 013
15	Mr. B.S. Kini	Indian Aluminium Company Ltd., Calcutta 700 071
16	Mr. Rajendra Kunwar	MECON, Ranchi 834 002

17	Mr. H. Mahadevan	Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur 440 013
18	Mr. S. Maitra	Indian Aluminium Company Limited Calcutta 700 071
19	Dr. C.R. Mishra	National Aluminium Company Ltd, Bhubaneswar 751007
20	Mr. M. Moitra	HINDALCO Industries Ltd., Renukoot Distt: Sonebhadra 231 217
21	Mr. K. P. Mukherjee	Hindustan Foundry & Engg Works, Korba, 495 681 (M.P.)
22	Prof. K. S .S. Murthy	Aluminium Association Of India, Bangalore 560 012
23	Mr. C. C. Paul	Indian Aluminium Company Ltd., Calcutta 700 071
24	Mr. R.G. Prasad	Bharat Aluminium Co. Ltd., Korba 495 681(M.P.)
25	Ms. V. R. Padgilwar	Jawaharlal Nehru Aluminium Research Development and Design Centre ,Nagpur 440 013
26	Dr. T.R. Ramachandran	Jawaharlal Nehru Aluminium Research Development and Design Centre ,Nagpur 440 013
27	Mr. A.S. Ramakrishnan	Aluminium Association of India Bangalore 560 012
28	Mr. G. Ramesh	Grindwell Norton Ltd., Devanahalli Road, off Old Madras Road Bangalore 560 049
29	Mr. P.K. Rastogi	HINDALCO Industries Ltd., P.O.Renukoot , Distt:Sonebhadra (U.P.) 231 217
30	Mr.R. S. Ray	Indian Aluminium Company Ltd., Calcutta 700 071
31	Mr. Joydeep Roy	Aluminium Association Of India, Bangalore 560 012
32	Mr. K.H.V. Reddy	Carborundum Universal Ltd., PB No. 1, Kalamassery Development Plot , Cochin 683 109 (Kerala)
33	Mr. P.K. Sen	Indian Aluminium Company Ltd., Calcutta 700 071
34	Mr. M.M. Seth	National Aluminium Co. , Bhubaneswar 751 007
35	Mr. O.N. Sharma	Bharat Aluminium Co. Ltd., Korba 495 684 (M.P.)

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- | | | |
|----|-----------------------|---|
| 36 | Mr. S.N. Sharma | Hindustan Foundry & Engg Works,
Korba, 495 681 (M.P.) |
| 37 | Mr. S. Sankaranarayan | Indian Aluminium Company Ltd.,
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| 38 | Dr. A.L. Sashimohan | Grindwell Norton Ltd.,
Devanahalli Road, Off Old Madras Road
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| 39 | DR. B.K. Satpathy | National Aluminium Co. ,
Bhubaneswar 751 007 |
| 40 | Mr. V.K. Sood | National Aluminium Co. ,
Bhubaneswar 751 007 |
| 41 | Mr. P. Vidyasagar | Jawaharlal Nehru Aluminium Research
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Nagpur 440 013 |
| 42 | Dr. J. Zambo | Chief Technical Adviser
Jawaharlal Nehru Aluminium Research
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This evaluation file is prepared by ALUTERV-FKI Ltd. on the basis of official UNIDO
evaluation file

EVALUATION - GROUP TRAINING PROGRAMMES

Name of participant: _____ Host
country: India
Programme: Workshop on Production and Application _____ Date: 25.10 -
30.10.1993
of Alumina Chemicals (DP/IND/88/015)

I. PROGRAMME CONTENT AND ORGANIZATION :

1. What is your opinion of the total duration of the course:

Too long	/	/
Just right	/	/
Too short	/	/

If not "just right", what, in your opinion would be the most suitable duration for the course?

/ / days

Please comment:

2. State your opinion about the daily schedule:

Too heavy / /

Just right / /

Too light / /

Comments:

3. Would you suggest any changes in the general nature of the training programme?

4. Do you feel that the training corresponded to your professional needs?

To a very large extent	/	/
To a large extent	/	/
To a sufficient extent	/	/
To a small extent	/	/
To a very small extent	/	/

Please comment:

5. What do you think of the general level of the training?

Much too high	/	/
Too high	/	/
Adequate	/	/
Too low	/	/
Much too low	/	/

Comments:

6. Which subjects of the programme did you find most valuable? (Please state reason; for example new subject, my speciality, relevant to my work, new information, etc.).

Subject

Reason

7. Which subjects of the programme did you find least valuable? State why (for example too elementary, inadequate instruction, irrelevant to my work, etc.).

Subject

Reason

8. Were there in your opinion any relevant subjects that were not adequately covered in the programme?

Yes / /

No / /

If yes, what did you miss?

9. Which changes would you have preferred in the methods of instructions?

	no changes	more	less
a) lectures	/ /	/ /	/
/			
b) panel discussion	/ /	/ /	/
/			

Comments:

10. How did you find the general standard of the instructors with respect to:

	i) command of English	ii) method of instruction
Very good	/ /	/ /
Rather good	/ /	/ /
Fair	/ /	/ /
Poor	/ /	/ /
Very poor	/ /	/ /

Please comment :

11. Did you have sufficient time for professional exchange of views with:

	i) <u>the programme staff</u>	ii) <u>fellow-</u> <u>participants</u>
Yes	/ /	/ /
No	/ /	/ /

12. How much did you benefit from these exchanges of views with:

	i) <u>the programme staff</u>	ii) <u>fellow-</u> <u>participants</u>
A great deal	/ /	/ /
Much	/ /	/ /

Somewhat	/	/	/	/
Little	/	/	/	/
Not at all	/	/	/	/

Please comment:

II. RELEVANCE AND APPLICABILITY:

13. Did you find the contents of the programme relevant to conditions in your company (institute)?

To a very large extent	/	/
To a large extent	/	/
To a sufficient extent	/	/
To a small extent	/	/
To a very small extent	/	/

Please state why:

14. Do you feel that by participating in this training programme you have benefited professionally?

To a very large extent	/	/
To a large extent	/	/
To a sufficient extent	/	/
To a small extent	/	/
To a very small extent	/	/

Please state why:

15. Do you think you will have an opportunity to apply your newly acquired knowledge and experience in your present job?

To a very large extent	/	/
To a large extent	/	/
To a sufficient extent	/	/
To a small extent	/	/
To a very small extent	/	/

What difficulties, if any, would you expect to meet?

16. Will you be in a position to transfer your acquired knowledge to others in your country?

To a very large extent / /

To a large extent / /

To a sufficient extent / /

To a small extent / /

To a very small extent / /

17. How will this transfer be done?

a) In a day-to-day work to colleagues and subordinates / /

b) In specific training activities inside present employment / /

c) In specific training activities outside present employment / /

What difficulties, if any, would you expect to meet?

III Further Suggestions

18. Further suggestions

EVALUATION - OF WORKSHOP PROGRAMMES

Name of participant:

Host country: India

Programme: Workshop on Production and Application
of Alumina Chemicals (DP/IND/88/015)

Date: 25.10 - 30.10.1993

I. PROGRAMME CONTENT AND ORGANIZATION :

1. What is your opinion of the total duration of the course:

Too long	/ 8 /
Just right	/ 15 /
Too short	/ 2 /

If not "just right", what, in your opinion would be the most suitable duration for the course?

/ 3 / days

Comments:

- [05] Contents for presentation were not very focused on the title subjects. As such, presentations were dragged with irrelevant matters to fill up timesheets awarded to authors.
- [08] Non metallurgical grade alumina route, special alumina manufacturing process, know-how, engineering design. Plant equipments and capacity needs to be elaborated.
- [10] Some of the presentation dealt in a lot of detail regarding the final use of the products rather than the product itself. I feel this could be reduced to a certain extent to gain some time.
- [11] Sometimes the presentation was lengthy.
- [15] Most of presentation were just reading out from the Handouts. This was not necessary and could have saved time.
- [16] Coverage of production process techniques could have been included for the benefit of participants. Inclusion of market scenario in Indian context could have been advantageous.
- [21] This particular programme dealt mostly with commercial and marketing aspects of the product. Some more stress on techno-applications would have been helpful for prospective parties.
- [33] Could be more precise presentations.
- [34] Though the name suggests it is a Workshop on "Production of Alumina Chemicals", but this aspect was not deliberated in details. Characteristics and application of Alumina Chemicals were covered in good length.

- [35] The course covered mainly commercial and marketing about of the object. More technical details with process know-hows would have been helpful.
- [?] Production part has been ignored. Almost all the speakers left this area excepting a few. Application part areas covered adequately.

2. **State your opinion about the daily schedule:**

Too heavy	/ 3 /
Just right	/22 /
Too light	/ /

Comments:

- [06] As times repetition of similar subject matter.
- [08] For each topics separate ten minutes discussion is essential
- [21] The duration could be slightly extended in the form of mutual exchange of thoughts and ideas on the field.
- [30] Boring lectures.
- [34] The topics were monotonous and heavy. In order to create good interest, some side subjects maybe included.
- [?] Very well organised.

3. **Would you suggest any changes in the general nature of the training programme?**

- [04] The lectures of the foreign experts should be interpreted with presentations by local companies on their experiences. More emphasis should be given to status of local industry, market scenario and market potential so as to give necessary impetus for the future development of the industry. In this aspect AAI and JNARDDC could play a significant role.
- [05] The presentations had not focused any specific training objective. Information shared were old production statistics, not carefully analysed.
- [06] Invite primary producers to present paper.
- [08] Plant visits of "GONDAL" and "HINDAL" is essential. At the plant sites lectures and discussion will be more fruitful.
- [09] It would be helpful if lecture notes can be given in advance to the delegates.
- [11] The training programme should be more informative and the discussion time should be increased.
- [12] Hungarian faculty was not the right choice.
- [15] Some more application related data may be presented.
- [24] Although the Workshop was aimed for the production and application of spec. alumina chemicals, but the production part particularly technology of speciality alumina chemicals was not given adequate coverage.
- [34] It is good that outline information was provided in a booklet form with a view to introduce the subject. More scope exists to enrich it to make it more informative and useful.

[40] Probably it would be better to have a interaction with consumers and producers; also to bring highly specialised experts.

[?] Comments as in item 1.

4. Do you feel that the training corresponded to your professional needs?

To a very large extent / 3 /

To a large extent / 5 /

To a sufficient extent / 7 /

To a small extent / 8 /

To a very small extent / 2 /

Comments:

[04] As explained in (3) a very little or rather no information was given on Indian market potential for speciality alumina chemicals, technology status, technology and availability.

[05] Very little flavour of training in course extents.

[08] a.) Samples of each grade with price tariff from different companies can be displayed.

b.) Comparison of products from big manufacturing companies with price tariff and international price can be enlighten during presentation.

[21] I would expect some more techno-theoretical details from the well-known and erudite faculty members.

[24] In fact there was no training.

[27] Training Materials could be supplied to the participants at least a week before the training programme.

5. What do you think of the general level of the training?

Much too high / /

Too high / 2 /

Adequate / 19 /

Too low / 3 /

Much too low / 1 /

Comments:

[06] As such since we are already us specials business for sometime the areas concerned are in general already known.

[12] Today, in the international market for speciality alumina hydrates and aluminas - ALUTERV in a comparatively small player and does not possess the best technologies. Under these circumstances, inputs from the so called experts was of low standard.

[27] My training and experience were mainly in the field of aluminium and alloys. As am I an information officer in the Aluminium Association of India. There was a

need for me to know more about alumina (the basic material for Al production and as a general engg. medium).

- [30] The standard of many lectures was very poor.
 [34] JNARDDC may like to put a style and well designed format for present paper with a view to bring in some (.....) of standardisation.
 [40] Understandably, the course through supposed to cover the production aspects, did not cover to a sufficient extent production of speciality hydrates and aluminas for reasons of confidentiality, as my opinion it would have been better if a little more information on production aspects was also revealed.
 [?] Production, an important area left almost untouched.
 [??] Adequate to high so far applications are concerned.

6. Which subjects of the programme did you find most valuable? (Please state reason; for example new subject, my speciality, relevant to my work, new information, etc.).

<u>Subject</u>	
All	3
Activated alumina	4
Alcan lecture	1
Alumina trihydroxide	3
Calcined alumina	1
Ceramic oxides	7
Fused + abrasive alumina	5
Main strategy	1
Marketing	3
Tabular alumina	5

7. Which subjects of the programme did you find least valuable? State why (for example too elementary, inadequate instruction, irrelevant to my work, etc.).

<u>Subject</u>	
All	1
Majority	1
Alcan lecture	1
Alumina trihydroxide	2
Calcined alumina	1
Ceramic oxides	1
Fused + abrasive alumina	3
Main strategy	1
Marketing	3
Tabular alumina	2

8. Were there in your opinion any relevant subjects that were not adequately covered in the programme?

Yes	/ 19 /
No	/ 4 /

Missing topics:

- [05] Testing methods, instruments, required and cost thereof. Importance of Quality Assurance for specials. Packing standards for fire products.
- [06] Not such detailed discussion on actual new technology.
- [08] Plant equipments data and testing equipments details are not covered for specials alumina chemicals.
- [09] Details of processing
- [11] The problem in analysis of speciality high pure alumina was not covered in this programme. Some impurities, which are present in ppm and ppb level and difficult analytical problem is to covered for quality checking.
- [12] As already mentioned, details of production processes were not concerned.
- [15] Most of presentation were just reading out from the Handouts. This was not necessary and could have saved time.
- [16] Production process routes, cost aspects, techno-economic analysis and most suitable process route.
- [18] Production aspect of the speciality hydrates and alumina was not adequately covered.
- [20] Specifications and process details.
- [24] There should have been more elaborations on the technology of products.
- [29] Preparation procedure and details to manufacture special ATH and alumina.
- [30] Subject was good but coverage was not upto expectation.
- [34] Production methods evolved in production of speciality alumina and various important technical parameters.
- [40] Production techniques of spc. hydrates/aluminas etc.
- [?] As stated at 1. and 5.
- [??] Production part of speciality products of hydrate and alumina their equipments use for various unit operations in details.

9. Which changes would you have preferred in the methods of instructions?

	no changes	more	less
a) lectures	/ 14 /	/ 1 /	/ 5 /
b) panel discussion	/ 10 /	/ 7 /	/ 1 /

Comments:

- [08] a.) Refractory consumers and R+D workers.
- b.) Abrasive consumers and R+D workers.
- c.) Alumina chemical panel. Participants can be grouped in above three panels on the afternoon sessions for the closer interact.

- [09] It would be helpful if presentation and discussions are focused on low technology products, high technology products and medium technology products.
Discussion on problems of energy, environment of local industries and how to overcome them learning from the experience of others.
- [11] Panel discussion time should be increased to understand the problem in better way.
- [12] Lectures were monotonous with little coverage of production methods (already mentioned) and experiences in this field.
- [15] More information about experimental and pilot plan data and behaviour of product at the customer end.
- [18] Lectures should be more organised.
- [35] More time is panel discussion help in elucidating and cleaning various aspects
- [?] It was excellent all through the session.

10. How did you find the general standard of the instructors with respect to:

	i) command of English	ii) method of instruction
Very good	/ 1 /	/ 3 /
Rather good	/ 6 /	/ 10 /
Fair	/ 13 /	/ 9 /
Poor	/ 5 /	/ 3 /
Very poor	/ /	/ /

Comments:

- [06] Rather monotonous.
- [07] However with the help of chart and extremely good literature given less commend of English language was not felt.
- [08] Practical instructions at the any of the plant site of "HINDAL" or "INDAL" will be more effective.
- [10] The poor command of English is explained by the presence of overseas delegates. However, their knowledge of English was good enough to communicate their ideas without any antiquity.
- [12] Quality of transparencies presented by some hungarian experts were very bad. Many of them were literally reading out was projected.
- [34] All had not come fully prepared and difference in quality of presentation was obvious.
- [35] Generally satisfactions.

11. Did you have sufficient time for professional exchange of views with:

	i) <u>the programme staff</u>	ii) <u>fellow-participants</u>
Yes	/ 19 /	/ 19 /
No	/ 5 /	/ 5 /

12. How much did you benefit from these exchanges of views with:

	i) <u>the programme staff</u>	ii) <u>fellow-participants</u>
A great deal	/ 3 /	/ 3 /
Much	/ 11 /	/ 7 /
Somewhat	/ 6 /	/ 10 /
Little	/ 5 /	/ 5 /
Not at all	/ /	/ /

Comments:

- [08] Each participants introduction and his activity of work should have been introduced to the programme staff before the workshop.
- [34] Benefit can be enhanced if lecture copies were given in advance (some were given of course).
- [35] The programme was tightly time-bound.
- [40] The field being highly specialised, there was hardly any interaction with fellow participation.

II. RELEVANCE AND APPLICABILITY:

13. Did you find the contents of the programme relevant to conditions in your company (institute)?

To a very large extent	/ 3 /
To a large extent	/ 7 /
To a sufficient extent	/ 9 /
To a small extent	/ 5 /
To a very small extent	/ 1 /

Reasons:

- [04] We are a non alumina company and want to enter the field of speciality alumina chemicals. The contents of the curve were tailor made for alumina companies only.
- [06] We are directly in this business.

- [07] We are consumer of aluminium hydrate and have no need at present for non-metallic alumina.
- [08] Topics covered are relevant for the new project ideas and its implementation.
- [09] Alumina materials/chemicals are relevant to the progress of Indian ceramic industry.
- [12] As of now, we are the only firm in India manufacturing special hydrates/aluminas. As such programme was expected further widen our knowledge on the subject.
- [16] Our organisation, MECON (L) Ltd. is already in the field and nice inputs given during the Workshop will definitely beneficial.
- [21] No have been engaged in the production and processes development of special aluminas in own company.
- [33] We are in this business
- [35] We are engaged in developing the industry of speciality aluminas.
- [40] Even though NALCO is in the field of SGA, with the depressed conditions of market and high market potentials. Spc. hydrates/aluminas have a big future. NALCO has plans to explore this market and participation has helped my organisation.
- [?] It could have been very useful if production of speciality aluminas would have been adequately covered.
- [??] Wide range of applications and properties are informed.

14. Do you feel that by participating in this training programme you have benefited professionally?

To a very large extent	/ 3 /
To a large extent	/ 6 /
To a sufficient extent	/ 8 /
To a small extent	/ 7 /
To a very small extent	/ 1 /

Reasons:

- [05] Our company is in this business, with the support of ALCOA, for last 12 years. Much advanced level course would have been useful.
- [06] Nothing new or of much interest.
- [08] Bauxite exploration geologist, I am benefited for its industrial applications other than metallurgical grade to a large extent.
- [12] As mentioned elsewhere, this program was partially successful in professionally benefiting me.
- [16] The areas like tabular aluminas and wide range of ceramic aluminas were dealt with in detail during discussions.
- [21] I have received sufficient technical information as well as mark-potentials.
- [34] As speciality alumina is a field in which I may have to want for my company in near future.
- [35] As stated in "13" above.

[40] The programme has been highly informative about application of special hydrates/aluminas.

[??] Knowledge of wide application, world market and properties of different grade products were discussed.

15. Do you think you will have an opportunity to apply your newly acquired knowledge and experience in your present job?

To a very large extent / 2 /

To a large extent / 3 /

To a sufficient extent / 11 /

To a small extent / 5 /

To a very small extent / 4 /

Difficulties:

[07] At present it is not our field of interest.

[08] Newly acquired knowledge can be put before the Gujarat mineral Development Board members. Difficulty expected that non technical members are mostly appointed in the GMDC Board. All Board meetings M.D and Joint M.D. are representing who are non technical professionals.

[12] As the inputs were not of much relevance.

[16] In developing the economic production process routes for different products.

[21] Some non technical informations details and their on field applications would have been non helpful.

[34] Yes as reasons are given against in point 14.

[35] Practical difficulties in applying the technical aspects dealt with non clarifications were wanted.

[?] To the extent it was covered in the programme.

[??] Equipment selection in different unit operations.

16. Will you be in a position to transfer your acquired knowledge to others in your country?

To a very large extent / 3 /

To a large extent / 3 /

To a sufficient extent / 11 /

To a small extent / 5 /

To a very small extent / 3 /

17. How will this transfer be done?

a) In a day-to-day work to colleagues and subordinates / 19 /

b) In specific training activities inside present employment / 4 /

c) In specific training activities outside present employment / 1 /

Difficulties:

- [08] "Gujarat Mineral Development Corporation" is not doing any development activities, except exploitation of minerals. Gujarat state mineral development corporation should spare some funds for developments of value added mineral products campaign.
- [34] More information may be required to satisfy all enquires.
- [35] In practical applications.

III Further Suggestions**18. Further suggestions**

- [05] a.) Higher level of participation from end-users would have brought on the development needs.
b.) Participation/presentation by University Scholars, dealing on related matters, would have helped bringing industry closer to Institutes.
c.) Agents for sophisticated instruments for Quality Assurance, as needed to support activities in this business, could furnish cost data, maintenance contracts, etc. for the prospective entrepreneurs to acquire relevant information.
- [06] Some presentation could have been given by Indian Institute of Science.
- [08] a.) Programme staff members can be taken to the bauxite rich states. Existing value-added projects of bauxite can be shown to them for the expansion, diversification and modification.
b.) Visits to the consumer industry and seller and buyers meet can be arranged keeping programme staff members as a liaison officer.
c.) Production technology and services rendered may be published in the house journal of the centre.
d.) "Monthly Home Bulletin" may be published by the JNARRDC, Nagpur.
e.) All special alumina chemicals price tariffs, with CIF 'value' can be compiled from companies and published in the suggested Bulletin.
- [20] Sight-seeing of user industries should be included.
- [24] a.) There should have been some visit to plants using aluminium chemicals around Bangalore.
- [27] Such Programmes of training related to aluminium and aluminium products should be organised.
- [??] a.) The workshop should highlighted some aspects of preparation methods along with equipments selection for such methods based on their commercial experiences.
b.) Also the addresses of such equipments manufacturer was not covered.

WORKSHOP ON "PRODUCTION AND APPLICATIONS OF ALUMINA CHEMICALS"

The workshop on "Production and Applications of Alumina Chemicals" was organised at the Jawaharlal Nehru Centre for Advanced Scientific Research Bangalore during the period Oct 27 - 29, '93. The workshop faculty was drawn from ALUTERV-FKI Budapest and the Hungarian alumina Plants. The services of these experts were made available through the assistance of UNDP/UNIDO as part of their support for the project of setting up of the Jawaharlal Nehru Aluminium Research Development and Design Centre Nagpur (Project No. DP/IND/88/015). The experts had made preparations for the Workshop on October 26, '93 and were available on October 30, '93 for offering consultations to the interested participants.

The main objectives of the workshop were the following:

- to provide information on world production, consumption, characterisation and applications of alumina chemicals
- to offer a forum for discussion between the producers, consumers and R & D and academic institutions in the country on various aspects related to alumina chemicals.

The participants (numbering forty two) were mainly from the aluminium industries, consumer industries (machine tools, refractories), R & D laboratories and academic institutions. Apart from the lectures from the UNDP/UNIDO experts, there were presentations from primary producers and from the consumer industries wherein some of the immediate needs in the country and problems were highlighted.


It has become clear that the area of alumina chemicals represents a highly competitive field and therefore the information available is extremely limited. Indian aluminium company has extensive experience in the field and are the only producer in India. The other alumina producers are keen to start some activities in the field but are limited by almost total lack of information. Considering these facts, it may be concluded that the workshop has provided some basic information and an opportunity for the Indian producers to discuss some of their plans with international experts. In addition a meeting point for interaction between the producers and consumers has been established.

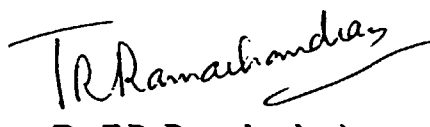
On the basis of the information made available and the discussions, it should be possible for the alumina producing companies to plan their strategies and formulate their programme with regard to alumina chemicals production in the country. Any basic research and development work needed in this regard would be carried out by the Jawaharlal Nehru Aluminium Research Development and

Design Centre along with other R & D organisations and academic institutions in the country.

The abstract of the report was prepared in Nagpur in agreement with the Project management.


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