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INTERNATIONAL WORKSHOP ON BUILDING CERAMICS FROM INDUTRIAL WASTES- TRIVANDRUM-695019 (INDIA)

March 22-26, 1999

Organised by

International Centre for Science & High Technology, Trieste, Italy,

in collaboration with

*Regional Research Laboratory, (Council of Scientific & Industrial Research),
Trivandrum-695019, India.*

FINAL REPORT

OBJECTIVES:

The workshop was organized with the following objectives:

1. To provide participants with the basic principles for the recognition of technological parameters of processes for wastes valorisation and their influence on production quality.
2. To present a panorama of the latest suitable technologies for the production of building ceramics from waste resources and discuss the main aspects concerning them for processing into valuable resources.
3. To disseminate updated information, knowledge and experience on design, production, testing and application of composite materials based on natural resources.
4. To promote the industrial use of environmentally friendly natural materials and propose new business opportunities by facilitating the transfer of technology in advanced and new materials while fostering South-South cooperation.

VENUE AND DATE:

The International Workshop on Building Ceramics from Industrial Wastes was conducted at Regional Research Laboratory (Council of Scientific & Industrial research, CSIR), Trivandrum-695019, India, during 22-26 March, 1999.

ORGANISATION:

The International Workshop was sponsored by the International Centre for Science & High Technology (ICS/UNIDO), Trieste, Italy and was organised by the Regional Research Laboratory (CSIR), at Trivandrum. This was also cosponsored by Council of Scientific & Industrial Research, New Delhi, India, and Building Materials and Technology Promotion Council (BMTPC), India. The Organising Committee consisted of representatives from ICS (UNIDO), and Dr. G. Vijay Nair, Director and senior colleagues, Regional Research Laboratory. Dr. K. G. K. Warriar, Deputy Director, and Head, structural Ceramics Group was the Chief Coordinator.

ICS was fully responsible for selecting the delegates and participants. However, the invited speakers from TNO Institute of Applied Research, The Netherlands, and Dr. U. Balachandran, USA were suggested by Regional Research Laboratory, which was approved by ICS. The Regional Research Laboratory was in charge of all travel and logistic arrangements. All information regarding the workshop, prompt correspondence and communication, letters and references for Visa and finalising travel plan and arranging travel tickets in some cases, local assistance, transport from airport and back, hotel arrangements etc. were done by the local organising committee. In addition, arranging the conference hall, technical lectures, group discussions, visit to the Building Materials Laboratory, local visits, the concluding session and compiling the recommendations, were the responsibility of the hosting institution, especially with the workshop coordinator and his team. The First Secretary of the Royal Netherlands Embassy in India, was the invited participant for the concluding session on 26th March.

FUNDING:

ICS (UNIDO) sponsored the workshop and provided US \$ 39,990.00, which was used for the international and domestic travel of the participants/invited guests. The expenses towards the local hospitality, hall, and presentation facilities, telecommunication, transport, secretarial assistance during the workshop etc. were met by the host institute. Part of the

expenses for the Proceedings of the workshop were met by funds raised locally from industry/CSIR/BMTPC etc. *The final accounts of the workshop are provided as Appendix 1.*

LECTURES:

There were 15 lectures in total, out of which 8 were from outside India. All participants, however, were provided with opportunity to talk. Eight lectures were from abroad representing The Netherlands (4), Italy (1), United States (1), China (1), Mongolia (1). The experts for the lectures were selected from major R&D organisations, industrial consultation agencies, departments for international collaboration, academic institutions, financial organisations dedicated to housing and introduction of new building materials and technologies. Some of the lectures were selected based on their official capacity to help the follow up actions decided at the concluding session recommendations, for example, Mr Andre' C. Vermeer, First Secretary of the Royal Netherlands Embassy, India and Mr. V. Suresh, Chairman & Managing Director, Housing and Urban Development Corporation, Government of India, representative of Mr. T. N. Gupta, Director, Building Materials & Technology Promotion Council (India). *A complete list of lecturers is included in the list of participants provided as Appendix 2.*

PARTICIPANTS:

The workshop was open to technical experts, scientists, architects, industrialists involved in building materials industry, environmental agencies, funding agencies engaged in promotion of housing, new building materials and technologies, and academic experts. There were 30 registered delegates and about ten invited attendees. In addition to the invited speakers, all the participants were provided an opportunity to share their expertise. There were also three discussion sessions where they could express freely their opinion, and share with others from the different countries. The sessions were very hectic, starting from 09.00 hrs. and extending to 18.00 hrs. *A list of all the participants and invitees is*

presented as Appendix 2. They represented countries such as China, Indonesia, Philippines, Malaysia, Mangolia, India, Italy, The Netherlands and United States of America.

MATERIALS DISTRIBUTED:

There were sufficient materials distributed in order that all the information was available to the delegates/lecturers in advance. The registration kit consisted of a shoulder bag containing list of participants with their affiliation and contact addresses, a detailed programme sheet and a ready-reference folder, an information sheet containing details of Thiruvananthapuram and all necessary telephone numbers of organising committee members, hospitals, railway station and airport, travel agent etc., and copies of the information materials supplied by ICS (UNIDO). The most important document was the compiled volume of lecture material collected in advance from the participants on their respective organisations and the papers intended for presentation. The kit also included a pen, a scribbling pad and a few colourful brochures from the tourism department of India/Kerala State. *A packet containing a typical set of materials is enclosed as appendix 3.*

PROGRAMME:

The workshop was arranged from 09.00h till 18.00h every day, during 22-26 March. *The detailed programme sheet circulated to the delegates in the workshop kit is attached in appendix 3.* Most of the invited lectures were arranged in the forenoons, and presentation from the participants in the afternoon. There were three discussion sessions including the concluding session. In many cases, the discussion on the lectures exceeded in time to the discussion.

All the participants were accommodated in single hotel as suggested by ICS, and the stay included breakfast. Arrangements for serving coffee/tea/snacks in the forenoon, afternoon, and lunch catering to the tastes of the participants from different countries, were arranged at the workshop venue, in order to save time as well as for convenience. In couple of days, the discussion session exceeded the time in the evening, and 'high tea' was arranged.

On the evening of 21 March, a welcome dinner was arranged at the hotel, where an introduction of the geographic, historical, scientific and cultural background of the host country, and the city of Thiruvananthapuram were described to the participants, by the coordinator. Director, Regional Research Laboratory (CSIR), welcomed the participants, and an informal introduction to the members of various committees for further contacts, if required for the participants, was made. The participants welcomed these arrangements, and they felt really comfortable. A programme on traditional dance of Kerala state was arranged on the evening of 24th followed by dinner. The valedictory dinner was arranged on 26th evening. A formal visit to RRLT and exposure to the research and industrial activities of the building materials programme were arranged on 24th afternoon. A visit to the city of Thiruvananthapuram containing international beach, art and cultural centres, academic and research institutes, boating through the coconut tree rimmed back waters, all were arranged on 26th afternoon.

Following the usual custom of this country, there was a formal inaugural function on 22nd at 09.00 hrs., where Dr. K.G.K. Warriar, Coordinator, welcomed the participants to the workshop, Dr. Luca ferroni introduced the theme of the workshop, representing ICS(UNIDO), Dr Vijay Nair, Director, RRLT presiding over the function and welcomed the participants to the Laboratory, Dr. Rinse A. Terpstra inaugurating (declaring officially the workshop open) by the conventional way of 'Lighting the Lamp', and Dr. K.G. Satyanarayana, Vice Chairman of the organising committee, extending a vote of thanks. The programme was covered by the Television and press media and was published in one of the leading daily newspapers, in the following day.

FEED BACK:

A consolidated report has been made from the filled response sheet questionnaire supplied by ICS. In general, the response was very positive. However, the salient response is provided below:

A. Organisation of Workshop

Excellent 56%

Very good 28%

Good 16%

B. Duration of the programme

Just right 64%

Too long 36%

C. Training facilities and Hotel

Excellent 16%

Very good 51%

Good 33%

D. Organizer's response to participants needs

Excellent 71%

Very good 14%

Good 15%

E. Overall programme organization

Excellent 50%

Very good 21%

Good 14%

Fair 15%

F. Would you recommend to others from your institution/country to attend a similar activity in the future?

Yes 85%

May be 15%

1. Which part of the activity did you find most useful?

Lecture, group discussions, case study, interactions.

2. Which part of the activity do you think should be expanded?

Case studies, a wide coverage of other waste materials also, factory visit, discussions, waste to energy concept.

3. Which part of the activity do you think should be dropped?

Out of theme lectures, elaborate introductions on host institutions

4. Any other suggestions for future improvements to the programme?

More concrete interaction, a compact programme extending to not more than 3 days, representation from more countries, advance information on the workshop, visit to working plant.

5. Do you think that the topics/tools you studied during the course could be used by industries in your country? If so, how? If not, why not?

For better knowledge transfer needs pilot plant level work before implementation. Project transfer also depends on local conditions prevalent in each country. This can be achieved only through proper communication, through continued research through separate R&D efforts.

6. Can you suggest any programme and future activities, which ICS could pursue in order to help with the technological and scientific advancement of your country?

Support to the CSIR mission programme on building materials as far as India is concerned, better popularisation efforts by ICS, mining tailings, home hold waste management by assistance from ICS, set up experts panel, details of technology available and resources available on sectoral basis, exchange of information through internet in future, RRLT should establish a training school through ICS and UNIDO aid.

7. Do you think you have benefited from participation in this course/ workshop? If so, how? And your institution?

Through better exposure, through case studies, by participation, by establishing contact with experts.

8. How do you intend to disseminate the information you have acquired during the activity once back in your own country?

Through better communication, through the report, by discussion with minister-head of institution- universities-industries etc., through industry interaction, by publishing the details, arranging a national seminar/meeting, in each of the participating countries.

- G. Evaluation of lectures and speakers

Very good 73%

Good 27%

H. Scientific knowledge of participants

<i>Balanced</i>	92%
<i>Unbalanced</i>	8%

VISITS:

Two visits were planned initially, (1) to an industrial concern which has manufactured building bricks incorporating agro wastes of this region, the coir dust (coconut pith) based on a know how developed at Regional Research laboratory (CSIR) Thiruvananthapuram, and (2), a visit to the Regional Research Laboratory, for a formal meeting and discussion with the scientists involved in various developmental activities. The former one did not materialise since the company was not functioning for the present. The visit to RRLT was made on the afternoon of 24th. The visit covered a formal introduction to the activities through a presentation by the Director of the laboratory. The various areas of activity are, ceramics, metals and alloys, polymers, agro processing, clays and clay minerals, and organic chemistry. The display of the various products were made, especially those related to building materials, such as light weight bricks and tiles with gradient porosity (from clay and coconut pith), chemical bonded laterite (alternate raw materials utilisation), vitrified tiles (value added terracotta products), tanslu bricks (utilising chrome tannery sludge), flux bonded fly ash (incorporating ~90%) fly ash and tiles of various colours obtained by controlled reduction firing. The approach to the development of such products involved elements of high scientific inputs, and this was appreciated by all participants. There was also association of TNO (Netherlands) in a few of the above developments. Some of the products were identified to have relevance to a few participating countries and exchange of details of the process and possible technology transfer will be carried out in future. The visit lasted for about three hours.

SOCIAL EVENTS:

A cultural evening was organised on the 24th followed by dinner to create an informal and relaxed occasion. A few of the local important officials were also invited. The organising

committee members were accompanied by spouses. The cultural programme involved a few events in the traditional dance art of this region, which involve liberal facial expressions of emotions. The performing artist explained in English, the history and the relevance, and the details of what she is performing, and could be followed in full spirit, by the participants from the various countries.

A visit to the important places in the Thiruvananthapuram city, such as the Art Gallery, Science Museum, the International Kovalam Beach, a boating through the back waters and visit to a few shopping centres, were arranged.

GROUP PHOTOGRAPH OF THE PARTICIPANTS OF THE WORKSHOP:

A group photograph was taken involving the invited lecturers, participants, Workshop Coordinator, and Director of the Regional Research Laboratory, Thiruvananthapuram, the members of the local organising committee, and a copy was handed over to each participant. *Photographs of all relevant functions and the group photograph are also included in the detailed proceedings of the workshop attached herewith as appendix 4.*

RESULTS:

The International Workshop on Building Ceramics from Industrial Wastes was successfully completed on 26th March, 1999. All the participants had a feeling that the same was useful. The lectures were very informative and there were three group discussions. Particularly in the host country, many senior members from administrative as well as policy making bodies, from agencies for promotion of industrial waste utilisation and research directors participated and extended their views. However, there was less representation from the user industry, except from one of the leading building material industries in this region, M/s Commonwealth Trust of India. But, as a follow up, a wide dissemination programme on the topic and of the ICS/UNIDO workshop is planned. The need for implementing the technologies already available in various countries, in their countries, as well as exchange of the available information between participating countries,

were well realised during the workshop. Further, it was strongly felt that there is still need for expanding the scope of development to more attractive technologies, where the basic idea should be use of maximum of the wastes, and for this, joint efforts should be made between the developed countries and the developing ones. In order to make convincing technologies, appropriate demonstration centres are very necessary to convince the industry and the end users for easy acceptance. Another necessity is the setting up of appropriate training centres to impart knowledge on the processes developed for processing of solid industrial wastes in building materials. All these have been discussed in the concluding session of the workshop held on 26th March.

COMMENTS & CONCLUSIONS:

As mentioned above, there is a dear need for thinking aloud on the disposal of the industrial wastes made available in bulk quantities in most of the developing countries of the world. The utilisation is best achieved through incorporation in building materials, since such wastes will find a safe disposal, and also contribute considerably in conserving the valuable non renewable resources. Some of the waste materials, especially of agro origin, contribute to fuel, thus conserving the fossil fuels used in ceramic processing. Of course, in specific cases, where high value materials could be developed from cheaper waste materials, research can be directed in such line. There is no systematic data available on the various wastes, nor the data of the extend of utilisation, especially in the developing countries.

One of the most important factors, found uniformly in all the participating countries, is the concern on the responsibility of the producer of the waste, to find a suitable way of disposal. It was generally accepted that there should be participation of the Government, the producer of the waste, and the agency utilising the waste to useful building materials. In fact, the waste of one industry should be the raw material for another, so that the term 'Waste' should be erased from the context. This will help a long way in effective utilisation of such byproducts. The role ICS can play, in such attempts was also discussed.

While many recommendations were formulated at the concluding session, the most important factor regarding the immediate follow up action to make the recommendations a reality, was discussed. M/s Common Wealth Trust of India, one of the pioneering agencies in the southern part of the country has shown initiative in organising a training programme in clay processing and development of new building materials from some of the waste materials available in this region, preferably by end of this year, through UNIDO. This will contribute to the 'awareness building', which is most important step in waste utilisation.

The details of the recommendations arrived at during the concluding session are provided below:

RECOMMENDATIONS OF THE WORKSHOP:

- 1 *The utilisation of building materials is an excellent opportunity that a new raw material resource is identified. These new resources help to conserve the depleting natural raw materials for building materials. Proper utilisation of such new materials also have considerable socio-economic benefit.*
- 2 *Although the appropriate method of disposal should be the primary concern of the producer of the wastes, the building material industry should be tuned to apply processes for making good quality building materials from wastes, for which incentives should be provided.*
- 3 *User agencies should be provided with adequate awareness on the use of building materials from wastes. Development and use of building materials from industrial wastes should be promoted by necessary government policies at different levels.*
- 4 *Appropriate technologies should be identified for the utilisation of wastes for the different countries, depending on the socio-economic and political situations. It may*

seem difficult to translate the approach followed in developed countries directly to a developing country. This calls for a detailed data base generation and analysis.

- 5 *Although many processes are available for the industrial waste disposal through building ceramics, a constant improvement of technologies for achieving maximum utilisation should be aimed at. Life cycle analysis of such materials is essential. Industry linked effective R&D on an International Basis is necessary for this purpose. Technical information should be shared between the participating countries. ICS(UNIDO) can play a key role in this line.*
- 6 *Technology parks and demonstration centres are necessary in order to impart awareness and confidence on technical feasibility and use of building materials derived from industrial wastes. The concept of a new class of building material and not a product from waste, should be brought in to the minds of the builders and architects.*
- 7 *Any new material development should be associated with appropriate education and training to the industry. Training centres of high standard are necessary for this purpose . The concept of use of industrial wastes in building materials should be introduced in the academic system in order to eliminate the present misconceptions on use of such materials.*
- 8 *It was recommended to have a joint effort between the participating countries of the workshop, supported by ICS to initiate further steps based on the above observations. The Regional Research Laboratory, Trivandrum was recognised as the agency to coordinate the future collaborative efforts, and to institute a training centre for ceramics processing and testing, jointly with ICS (UNIDO).*

ACKNOWLEDGEMENT:

The local organising committee of Regional Research Laboratory (CSIR), Trivandrum, India is extremely thankful to ICS/UNIDO for selecting Trivandrum (India) as the venue for the workshop and also for the funding. UNIDO is specially acknowledged to have taken special efforts for the transfer of funds on time. The excellent co-operation extended by participants and invitees to the workshop is greatly acknowledged. The great enthusiasm shown by Dr. Francesco Pizzio, ICS Managing Director, Trieste, Italy for approving the theme of the workshop as well as for making available necessary funds to support the same is highly appreciated. Dr. Luca Ferroni, ICS representative actively participated all through the workshop and extended necessary coordination. Thanks are due to the ICS secretariat, which has taken pains to extend all information and support when necessary, including short notice response through all available communication channels.

Appendix 2

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Trivandrm - 695 019, India



Theme lecture by Dr. Luca P. Ferroni of ICS (UNIDO), Italy



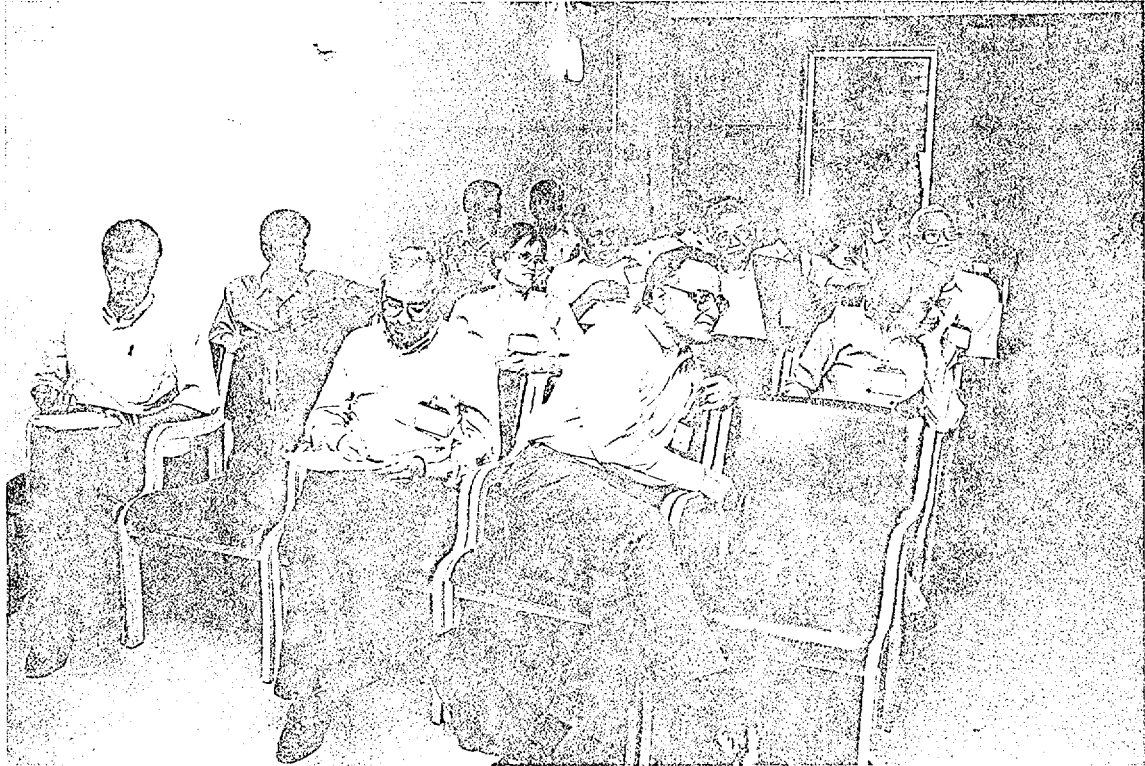
Inauguration of the ICS workshop by Dr. Ing. Rinse A. Terpstra of TNO Institute of Applied Physics, The Netherlands



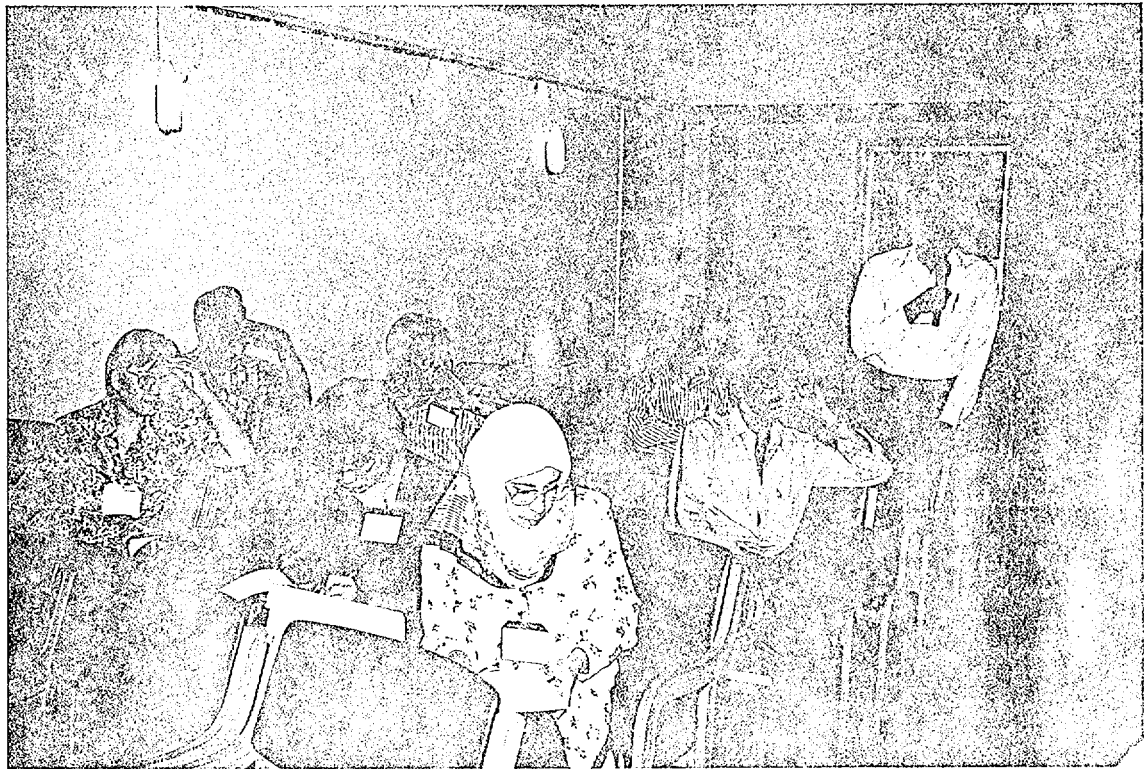
Keynote address by Mr. Andre H. de Vries, TNO Institute of Applied Physics, The Netherlands



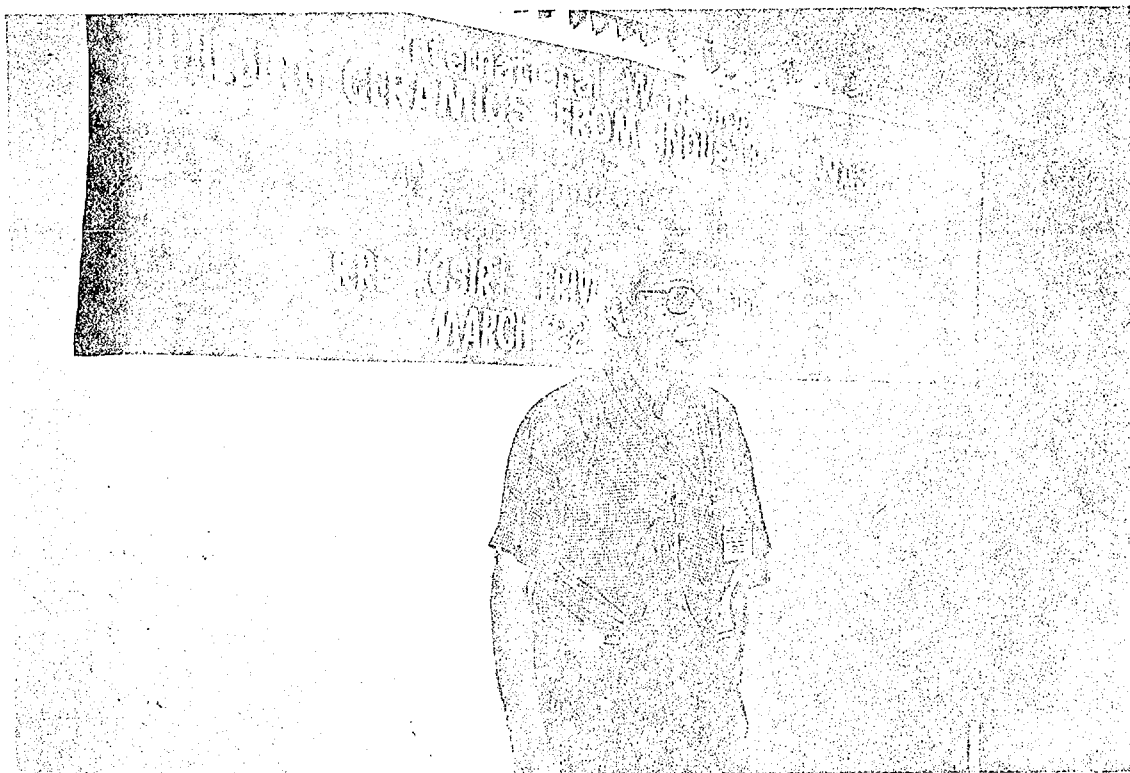
Introduction of the technical session of the ICS workshop by Dr. K.G.K. Warriar, RRL, Trivandrum, India



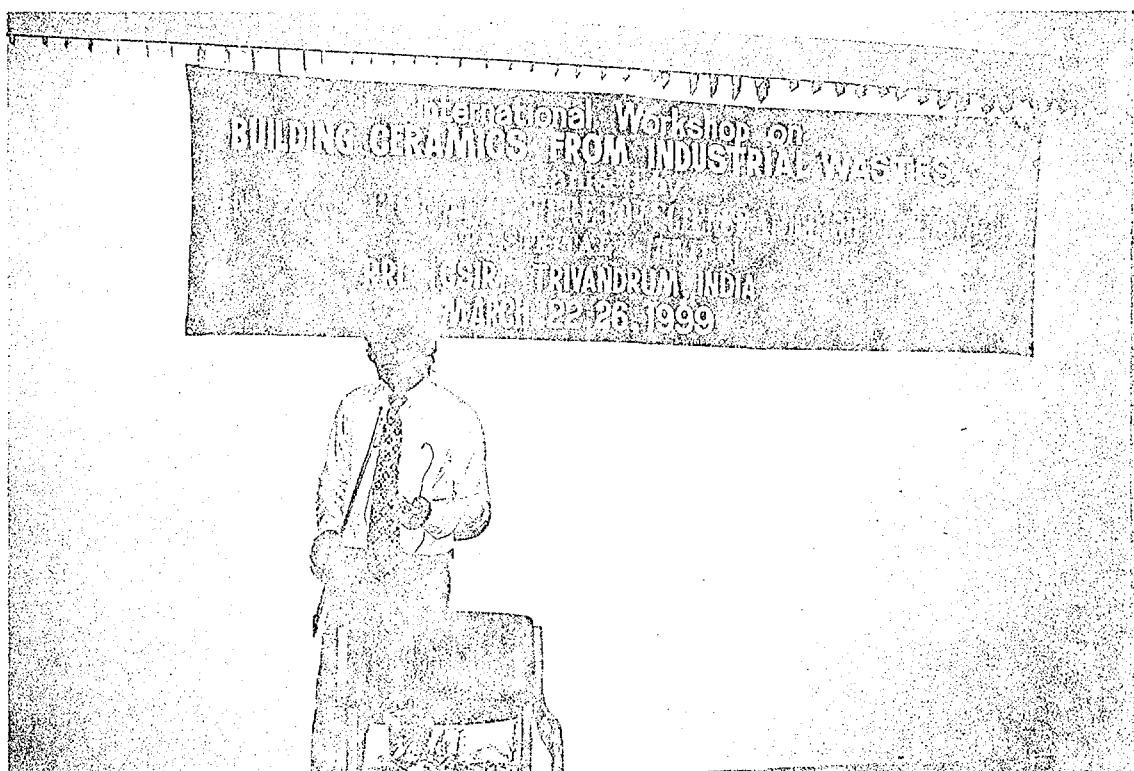
A section of ICS workshop participants



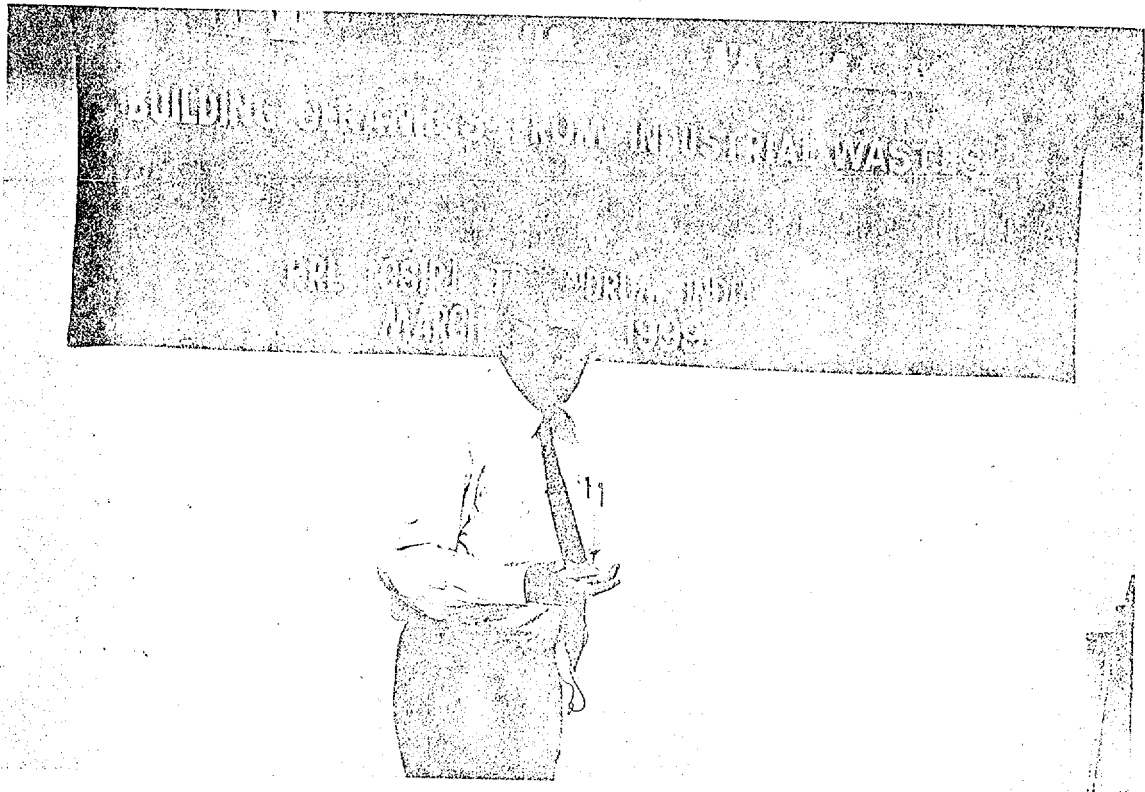
A post presentation discussion session



Invited talk by Prof. Dr. Wang Pu, China Fly Ash Utilization Center, Shanghai, China



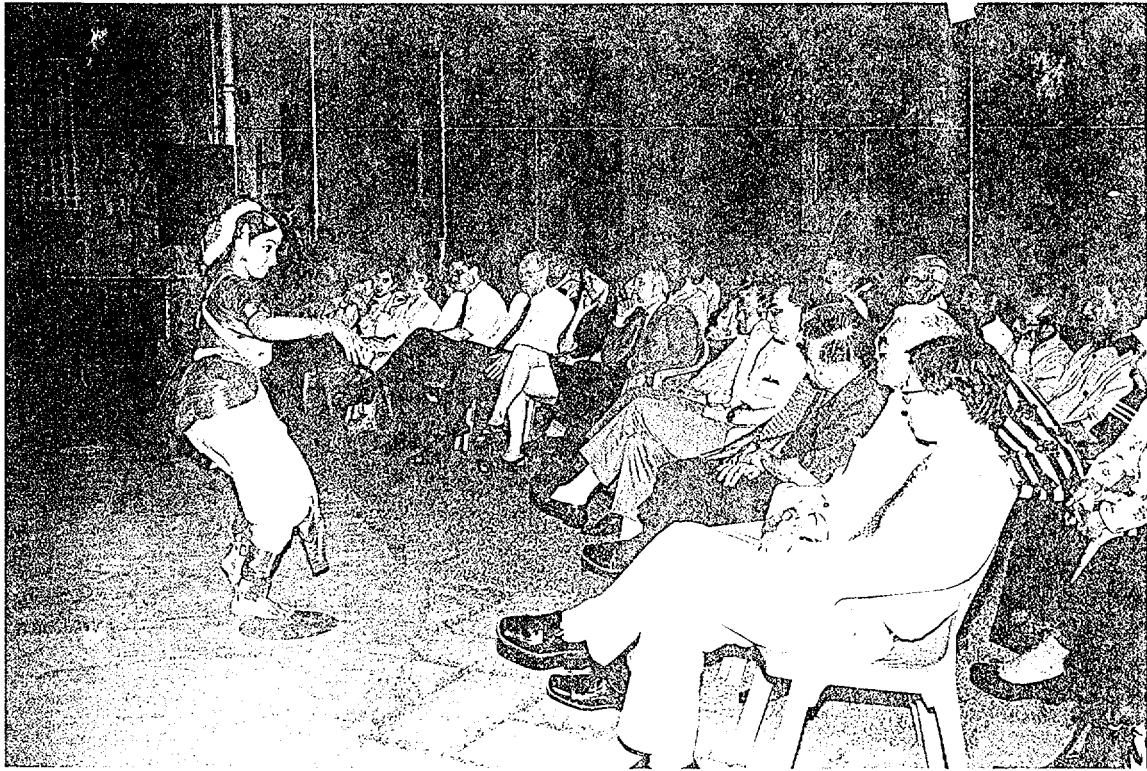
Invited lecture by Dr. T. Ramasami, Director, Central Leather Research Institute (CSIR), India



Valedictory address by Mr. V. Suresh, Chairman,
Housing & Urban Development Corporation, India



Expression of his considered views as the Chairman,
Valedictory session, by Mr. Andre C. Vermeer,
First Secretary, The Royal Dutch Embassy in India



Cultural programme – A travel into the traditional dance performance of South India



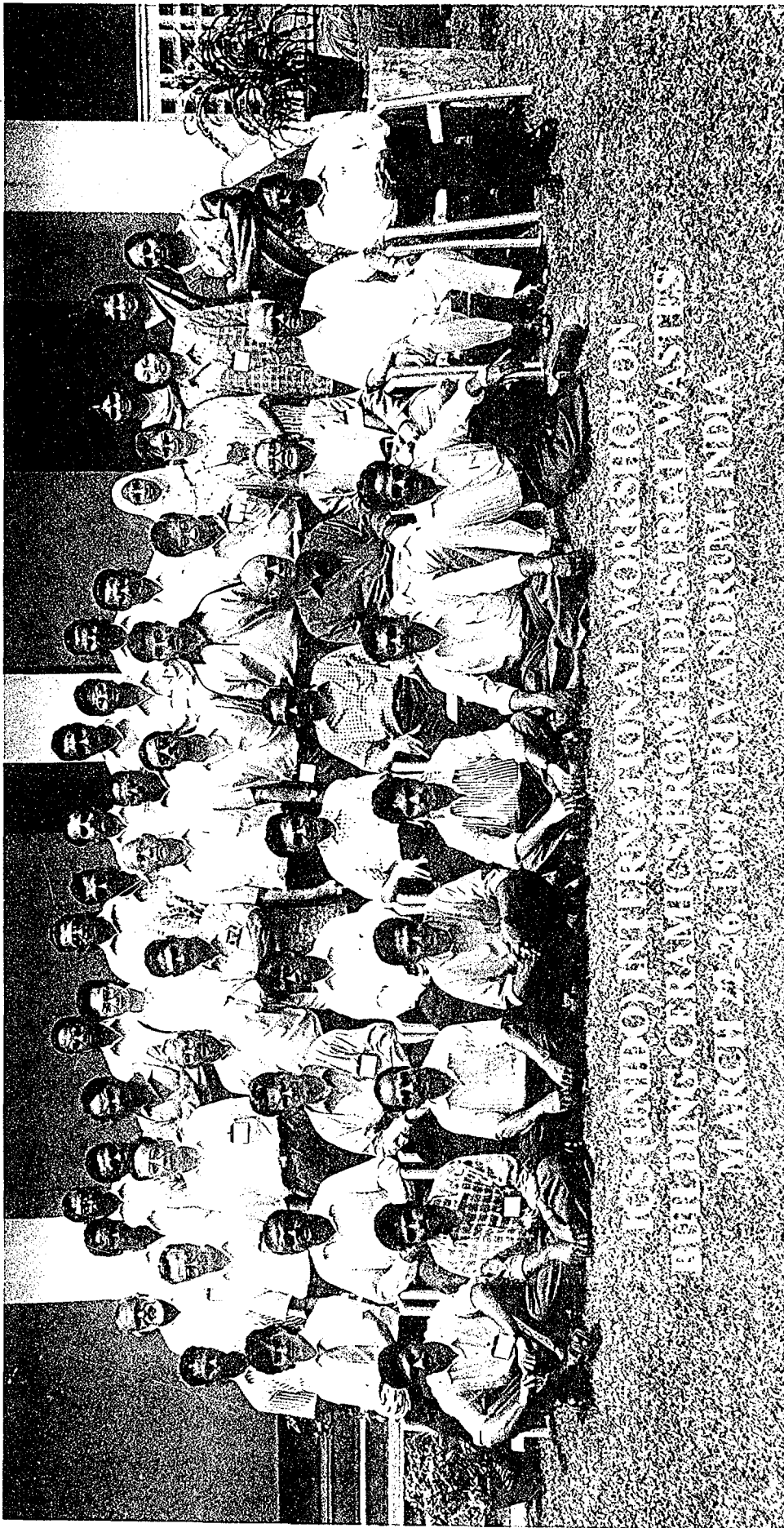
Relaxation over dinner – A change of taste?



A spell of relaxation



A warm welcome to the distinguished visitors at RRL
by Dr. G. Vijay Nair, Director, RRL, Trivandrum



THE SENIORS AND JUNIORS OF THE UNIVERSITY OF MICHIGAN
AT ANN ARBOR, MICHIGAN, U.S.A.
MARCH 1954