

# BARC NEWS LETTER

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## Web Based Environment Monitor and Control System

H. K. Kaura, V. S. Indurkar, P. S. Dhekne, J. J. Kulkarni,  
L. Prasad Babu and U.C. Lad  
Computer Division

### Introduction

Internet provides a very powerful communication medium for developing projects that integrate distributed environments. However, so far, Internet has mainly evolved as a unidirectional tool. Web based information propagation is not restricted to the manually inputted web page hosting alone. It is also conducive to accessibility of real-time data inputs which are the measured values from various transducers such as image from CCD camera, temperature, smoke detectors, pressure, light intensity, humidity, etc.

A system based on a web client/server approach has been designed by Computer Division, BARC, which is used for remote monitoring of various computer facilities in BARC-campus through image viewing, reading the environmental parameter values and for the relay on/off controls by a web based remote client. This is a continuous data monitoring system for measuring ambient physical parameters of computer centre environment. The data control client computers placed at each centre acquires parameter data continuously, captures

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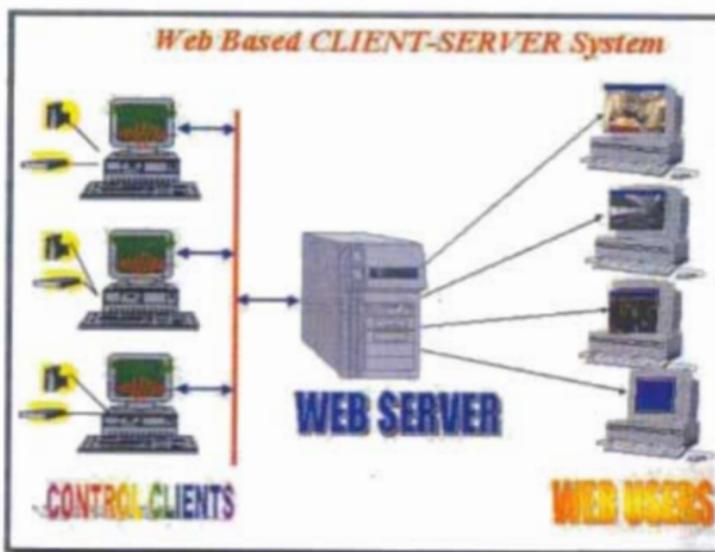
the image snap-shots within the computer centre/hall and stores (refreshes) them at preset intervals along with the instantaneous values of environmental parameters on a HTTP server. Some of the monitored parameters are temperature, illumination, humidity, supply voltages, etc. In addition, there are the relay switching operations which are coupled to these environmental parameters, such as the air conditioning or the lights switching. By toggling these relays, one can control the system either locally or remotely through Internet. All this information is available on Internet to the authorized user clearing the security barriers.

There can be numerous application areas for this type of a system. Many situations can arise when the data acquisition equipment have to be placed in or near hostile environment or in remote, or hazardous place. In such situations, it is desirable

that the data may be accessed through a remotely placed client feeding an Internet server. The system is typically very useful for any distributed environments, such as,

1. Meteorology, where measuring units are placed exposed to natural elements and data logging is continuous day and night.
2. Environmental monitoring at nuclear stations, radioactive labs., nuclear waste immobilization plants, etc.
3. Medical and biological research laboratories.
4. Security installations.
5. Other similar situations.

But the use of this system is not limited to only these applications. The most critical factors in remote access solutions are security, speed and reality. The web-based client/server approach ensures all these aspects.





## Web Based Environment Monitor and Control System



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For more information and queries, please contact [Website](#).

### System Components

1. An Internet based HTTP server providing the FTP service for uploading information in web format.
2. A number of control clients placed at each centre acquiring image and various transducer parameter values, and updating the server at preset intervals, and also receiving commands via server.
3. An authorized user who clears security barrier of Internet access with web browser from anywhere.

### Control Clients

There are a number of control clients – PCs, one at each monitoring station. Data and image acquisition tasks run continuously in these to monitor the physical parameters which are inputs to the system. The following three tasks run in each of these in multitasking mode.

- An image frame-grabber takes the snapshot from the attached CCD camera at a preset interval and stores (updates) it on a HTTP server.

- An A/D Converter interface adapter takes signal samples from each of the 16 multiplexed inputs at a preprogrammed rate and converts them to a digital value. The software component in control client compares them with the preset high and low threshold levels and stores (updates) them into a data file with appropriate remarks. This data as well as the image are continuously displayed on the control client, and so corrective action can be taken locally by the operator in case of any alarm condition pertaining to any of the measured parameters. This can also be carried out remotely by an authorized user from anywhere, using any browser.
- At an another preset interval, these two files with fresh set of data are uploaded to the HTTP server. They are thus available on the web to an authorized user clearing the security barrier.

### The Server

The home of the web based environment monitor and control system is hosted here. It provides the HTTP and FTP services. It also monitors each of the

control clients attached to it through an active control program. When a user gets an access to this server, it displays on its index page an icon for each of the control clients. These icons are, in turn, hyper-linked to the pages that store the image and parameter values of the concerned client. Thus, the user can click a desired icon to view the state of image and parameter values at any control client.

These client pages are also the place from where one can remotely operate the relay associated with the parameter-control, provided the user is authorized to clear the security barrier.

At present, a Pentium II machine is used, running Windows NT operating system to host all these pages.

**Main Computer Hall**

**Parameters**

24 Nov 99 15:22:47

Light (R1)	Normal
Light (R2)	Normal
Temp (R1)	24.00 C
Temp (R2)	24.00 C
Humidity (R1)	75.00 %
Humidity (R2)	75.00 %
Relays	N.O.
Relays	N.O.
Power +5V DC	OFF
Power +8V DC	OFF
Power +12V DC	OFF
Power +12V DC	OFF

Relay 1:

Relay 2:

Relay 3:

Relay 4:

**PC Instruments Lab**

**Parameters**

24 Nov 99 15:26:57

Light (R1)	Normal
Light (R2)	Normal
Temp (R1)	24.26 C
Temp (R2)	24.26 C
Humidity (R1)	75.20 %
Humidity (R2)	75.20 %
Relays	N.O.
Relays	N.O.
Power +5V DC	OFF
Power +8V DC	OFF
Power +12V DC	OFF
Power +12V DC	OFF

Relay 1:

Relay 2:

Relay 3:

Relay 4:

## *The User*

The user can access these pages by using any web browser only on authorization by the system administrator. He is given the password keys. There are two levels of authorization.

1. Monitoring the password .
2. Monitoring and controlling the password.

If the authorized user needs to control or effect changes at the control client end, he can send command strings to the server by pressing the link-buttons . The server will then evaluate and send the requisite controls to appropriate control-client for the relay on/off operations. He can simultaneously monitor on-line the changes done at the remote control client site.

## **Enhancements**

The system, as described above, has an excellent connectivity in both LAN and WAN environment, where web-page access is from the server. The uploading of various data files to a server is on a continuous time-slot basis from the control-clients. It was observed that as the number of control-clients are increased, consumption of network bandwidth also increases, leading to network-clogging. In LAN environment, a large bandwidth is available and connectivity is permanent unlike in WAN dial-up, where connection is established during upload time only. This aspect was made use of in overcoming the tendency of bandwidth saturation. In this version of the software, modifications are done in order to effectively use the available higher LAN bandwidth by incorporating Personal-Web-Server (PWS) based control-client software.

In this approach, each of the control-client connected in a LAN additionally works as a web

server and stores its own data and image files locally instead of uploading to a central web server. On a request from a web-user, central web server redirects control directly to control-client, where PWS uploads the data and image files directly to the web-user, thus avoiding uploading the files to a central server continuously on time-slot basis. In this way bandwidth clogging of the local network is avoided, as uploads are done only on request basis. Additionally, this helps in faster remote control operation which may become critical in real-time control operation.

Another control-client may be connected using dial up WAN link. The WAN connection may be deployed using any of the standard connectivity such as wireless modem, cable modem, and VSAT connection. In this case, connection to a central server is done using point-to-point connection with TCP/IP protocol.

In this configuration, the modem connection uploads the data files to the central server on a set time-slot basis, whereas the LAN connectivity is through PWS.

## **Future Developments**

The software is being further developed to integrate the archival storage of image and parameter data files - date and time stamped. The web-user will then have an option to make a comparative study of information available from any control-client. The environmental data is already accessed as per the preset threshold values to indicate any alarm condition, if present. Further, software is being developed for image comparison capability. In this case, when a user gets an image from the control client, he will also have an option to download the previous/ archival stored image and compare them to find noticeable differences, if any.

## Conclusion

It was endeavoured to employ the web based techniques for dissemination of the real-time data with easy accessibility on internet. The critical analytical tools – some of them already made and

the others being made – make this approach very useful. It is also flexible and expandable in future applications such as the remote monitoring of factory processes, remote monitoring of hazardous location, security and many other variants.

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# Development of Advanced Ultrasonic System for Measuring Diameter of Pressure Tubes of 220 MWe PHWRs

Rajesh Taneja, M Padmanabhan, H M Bapat and Manjit Singh  
Control Mechanisms & ISI Section, Reactor Control Division

## Introduction

Under IX-Plan project, "Development of Tools and Techniques" (Power-6), development of state-of-art technologies for in-service inspection of coolant channels of PHWRs has been taken up at CM&ISI Section, RCnD. Under this project, an advanced ultrasonic system for measuring diameter of pressure tubes of 220 MWe PHWRs has been developed. The system has resolution of measurement of one micron and overall accuracy better than ten microns. The system can be used for precise measurement of diameter creep of pressure tubes during in-service inspection of coolant channels.

## System Description

The system utilises a custom-built state-of-art computer based four channel ultrasonic instrument, pre-amplifiers, ultrasonic probes and user interface. Windows-based software is used to control the instrument. Extensive facilities are provided for the setup of the instrument. The instrument is modular in construction and is designed for field use. The cable distance between the probes and pre-amplifiers is 15 metres whereas the cable distance between pre-amplifiers and the ultrasonic

instrument is 100 metres. The signal noise level is brought down to very low value by proper adjustments in the instruments.

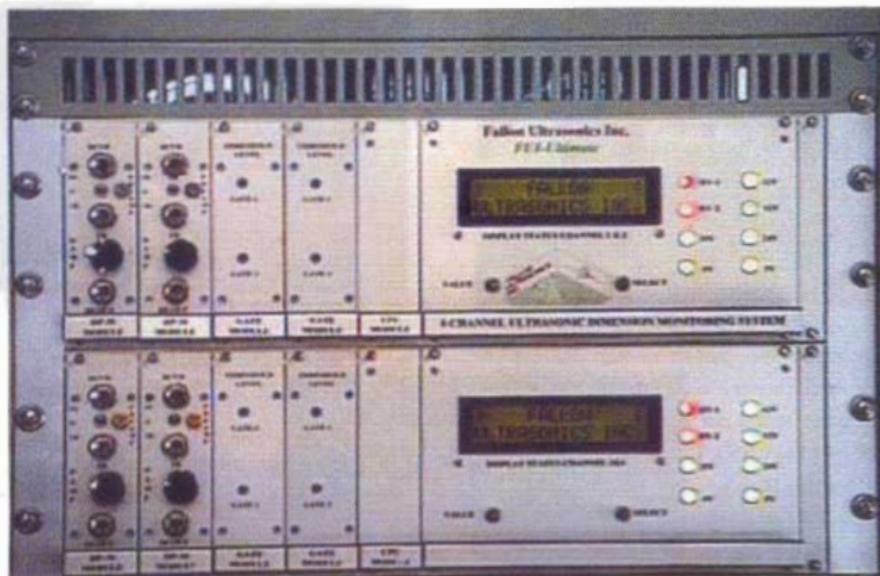
## Ultrasonic Instrument

The ultrasonic instrument comprises of following modules.

- CPU module for control of instrument and communication with computer
- Pulsar receiver module, one number each per channel. These modules can be used with standard probes or probes through pre-amplifier. Upto 50 MHz probes are supported.
- Gate module, one number each per channel. Each module has two gates. The second gate is always synchronised with echo in the first gate. This ensures that the back wall echo always appears at the same place irrespective of the probe wobble. The resolution of time of flight measurement is one nano second.

## Pre-amplifiers

Totally enclosed remote pre-amplifiers suitable for use in Fuelling Machine Vault have been developed. Totally enclosed design helps in minimising the contamination level.



Four channel ultrasonic instrument

## Probe Holder

The probe holder carries three ultrasonic probes mounted 120 degrees apart for diameter measurement. It also carries another probe and a calibration piece of pressure tube material for the measurement of ultrasonic wave velocity in metal and water. Suitable arrangements are provided to keep the probes perpendicular to the pressure tube surface. A universal joint is provided for free movement of the probe holder inside the sagging pressure tube.

## Scheme of Measurements

Three ultrasonic probes mounted 120 degree apart form the measurement channels. Each of the three measurement channels measures time of flight from initial pulse to first echo and from first echo to second echo. The data forms three points on a circle, from which ID and OD are calculated. The

wall thickness is measured directly at three points on the periphery. The ultrasonic wave velocity in water and metal is computed by measuring time of flight for known distance between the fourth ultrasonic probe and the calibration piece. The time of flight readings from three measurement channels are corrected for change in ultrasonic velocity with temperature.



User interface



Probe holder



Setup menu



DAC setup menu

## User Interface

The instrument provides windows-based user interface. It provides extensive facilities for setup and calibration of the instrument using well laid out setup menus. The inspection data is displayed in both numbers and as strip charts.

## Other Applications of the Ultrasonic Instrument

Since the instrument has provision for precise measurement of amplitude in addition to time of flight measurement, it can be used for detection of zirconium hydride blisters. It has been possible to detect one mm diameter blister using amplitude of reflected shear wave and difference in time of flight between shear wave and longitudinal wave. Further qualification of the technique for in-situ detection of hydride blisters in pressure tubes of 220 MWe

PHWRs is in progress. The blister samples for lab testing and qualification are being prepared by Material Sciences Division, BARC.

## Conclusion

An advanced ultrasonic system for measuring diameter of pressure tubes in 220 MWe PHWRs has been developed. The system shall help in precise measurement of diameter creep of pressure tubes during in-service inspection of coolant channels. The difficulties earlier faced in pressure tube wall thickness measurement while using 100m long signal cables with standard thickness tester have been overcome in the present system through the use of suitable pre-amplifiers. The system developed is the first of its kind in the country. Three numbers of systems are available for implementation in BARCIS.

## PUBLIC AWARENESS PROGRAMME ON RADIATION SAFETY

To enhance awareness about safety in the applications of radiation, a public awareness programme was organised at Sardar Patel University, Vallabh Vidya Nagar (Gujarat) during January 6-7, 2000 by the Public Awareness Programme Committee (PAPC) of the Indian Association for Radiation Protection (IARP). Special lectures, discussions and video film shows were arranged for the 42 college lecturers in physics from various colleges in Gujarat and neighbouring states who were attending the three-week Refresher Course under the UGC Scheme, and about 150 MSc students from the Department of Physics and Chemistry. Several questions were raised from the audience who expressed satisfaction after the question-answer session.

The topics of lectures/discussion included Natural & Man-made Radiation, Internal & External Exposures, Technologically Enhanced Radiation, Environmental Monitoring, Radiation Protection in Medical and Industrial Applications of Radiation & Radioisotopes. MSc students, research scholars and faculty members showed keen interest during the session devoted to "Nuclear Energy Programmes in the Country and Environmental Safety".

A set of video cassettes on Radiation in Environment and Safety in Radiation Uses and a Compact Disc containing the text of the lectures delivered during the IAEA Regional Basic Professional Training Course on Radiation Safety held at BARC during 1998 were presented to Prof.V.S.Patel, Vice-Chancellor, S.P. University, by the Public Awareness Programme Convener, Dr.S.R. Sachan of BARC. Prof.A.R.Jani of the Department of Physics, S.P.University, coordinated with IARP for conducting the programme.



*Dr S.R. Sachan, Convener, PAPC, presenting a set of video cassettes on public awareness on radiation safety to Prof. V.S. Patel, Vice-Chancellor, Sardar Patel University, Vallabh Vidya Nagar, Gujarat*

Encouraged by the response, several such programmes in other locations, such as at Jabalpur, Aurangabad, Solapur and Hyderabad, are being organised.

As a part of another public awareness programme for high school students, an important segment of the society, IARP organised Essay competition in Marathi language on the topic, "Myself in the vicinity of Tarapur", for X-XII standard students of various schools from Mahim to Bordi. A total of 51 entries were received. More than 80% entries were from the girl students and were found to be of good standard.



*Dr Anil Kakodkar, Director, BARC, giving away the first prize of the Essay Competition held at Chinchani to Ms Krupali Kamalakar Save*

An exhibition was arranged for students and general public at Save Technical Institute, Chinchani, with the help of Publicity Division, DAE. Dr. Anil Kakodkar, Director, BARC, distributed prizes to the Award winners of the Essay competition, during the annual function of the Save Technical Institute on January 15, 2000. Mr H.C.Katiyar, CS, TAPS, Dr K.S. Parthasarathy, President, IARP, Dr R.K. Kher, Secretary, Dr S.R.Sachan, Convener, PAPC, IARP, Mr S.J. Raut, Ms Vandana A. Pulhani, and Ms Pramila D. Sawant were among others who attended the function.

## ADMISSION RULES RELAXED FOR BRIGHT STUDENTS

The top students after 12<sup>th</sup> Standard do not pursue studies in the basic sciences like Physics and Chemistry. The Department of Atomic Energy inducts scientists through BARC Training School. To induct bright students to BARC Training School, it is necessary to motivate bright students, such as those who qualify for medals in the International Olympiads in Physics and Chemistry, to pursue studies in basic sciences. In view of this, it has been decided that such bright students, should they pursue studies in Physics or Chemistry up to M.Sc. level and also maintain high standard (at least above 65% in undergraduate and graduate levels), will be offered direct entry to the BARC Training School (one year orientation course) subject to only medical examination.

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## CONFERENCE ON AEROSOLS

A two-day conference on "Aerosol Behaviour in Confined Environments" was organized by Indian Aerosol Science and Technology Association (IASTA) during February 2-3, 2000, at Homi Bhabha Centre for Science Education, Mumbai, followed by a one-day workshop on "Instrumentation for Aerosol Characterization" on February 4, 2000 at Environmental Assessment Division, BARC. The conference included an exhibition of radioactive and atmospheric aerosol related equipments.



*Dr Anil Kakodkar, Director, BARC, inaugurating the conference on "Aerosol Behaviour in Confined Environments" at Mumbai on February 2, 2000*

The three-day programme, supported by AERB and BRNS, was inaugurated by Dr Anil Kakodkar, Director, BARC. Dr. P.C.S. Devara, Dy. Director of IITM, Pune and Vice President IASTA, welcomed the chief guest and the other delegates. Dr U.C. Mishra, President IASTA, in his address, spoke on the present status of IASTA activities and its role in spreading aerosol science to various institutions across the country. Dr. Anil Kakodkar focussed on the theme topic of the conference and emphasized the need to carry out aerosol studies from the point of view of reactor safety through the experimental facilities set up for simulating aerosol behaviour in containments. He pointed out that an integrated approach involving both modeling and measurements is crucial for arriving at meaningful environmental risk estimates due to nuclear power plants. The key note address on the topic "Nuclear Power Plant Safety - Fission Product Source Term and Aerosol Modeling" was delivered by Dr V. Venkat Raj, Director, Health, Safety and Environment Group, BARC. He reviewed the present status of the models available for estimating fission product source term and describing aerosol behaviour in the coolant circuit and containment of a nuclear power plant, under the postulated, extremely

low probability event of a "Beyond Design Basis Accident" condition.



*Inaugural function of the conference on "Aerosol Behaviour in Confined Environments", February 2-3, 2000. (Left to right : Mr .Y.S. Meyya, Dr V. Venkat Raj, Dr Anil Kakodkar and Dr U.C. Mishra)*

About 100 delegates and three invited speakers participated in the conference. The invited talk by Prof. D.L. Henshaw of Bristol University, U.K., dwelt upon his recent findings of increased radon and pollutant exposures to humans living under high voltage power lines. This has been proposed as a possible mechanism for explaining the increased cancer incidences in populations living under power lines. Prof. Chiu-Sen Wang from the Department of Public Health, Taiwan, presented his studies on indoor pollution in Taiwan wherein he highlighted the use of particulate n-alkanes as tracers for vehicular exhausts. Vehicular emissions were found to contribute about 49% to ambient aerosols and 30-45% to indoor aerosols in typical buildings. Dr. P.C.S. Devara, IITM, Pune, presented a review of the Indian scenario of aerosol studies through passive remote sensing techniques. The conference was divided into the following sessions: Radioactive and nuclear aerosols, Atmospheric pollution and Indian Ocean Experiment (INDOEX) studies, Aerosols in Industry, Indoor aerosols, Atmospheric aerosols and remote sensing techniques. A total of

45 papers were presented in these sessions and deliberated upon. The meeting concluded by noting that IASTA should bring out database on the aerosol activities and facilities available at various institutions across the country.

About 25 delegates from different institutions and industries participated in the workshop conducted in EAD on February 4, 2000. Hands-on demonstration of advanced instruments for physical and chemical characterization of aerosols were made during the workshop. Lecture notes on the essential principles and applications of these instruments were given to the participants.

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## SYMPOSIUM ON SPECTROSCOPY OF LANTHANIDES AND ACTINIDES

Board of Research in Nuclear Sciences of DAE organised a symposium on "Spectroscopy of Lanthanides and Actinides" at BARC during November 16-19, 1999.

Inaugurating the symposium, Dr Anil Kakodkar, Director, BARC, emphasised the importance of the spectroscopy of lanthanides and actinides in basic research and technology. As an example, he cited the importance of spectroscopy in the laser clean-up of Uranium-233 which is an important aspect of the thorium utilisation programme of DAE. He stated that the spectroscopy of lanthanides and actinides offers an opportunity to study some of the most fascinating aspects of foundations of physics and chemistry.



*Dr Anil Kakodkar, Director, BARC, inaugurating the "Symposium on Spectroscopy of Lanthanides and Actinides"*

Dr Kakodkar highlighted the importance of spectroscopy of these elements in areas such as nuclear energy, laser technology, detectors and sensors and lanthanide based catalysts.

In his presidential address, Dr S.K. Sikka, Director, Solid State & Spectroscopy Group, BARC, elaborated the role of spectroscopy of lanthanides and actinides in basic research and in nuclear energy. He brought out the interesting aspects of the condensed matter and high pressure physics of these elements.

The technical programme of the symposium consisted of 27 invited talks, 21 invited presentations and 79 contributed papers. These covered aspects of the spectroscopy of lanthanides and actinides notably the atomic and high resolution spectroscopy, laser isotope separation, quality assurance in nuclear fuel cycle, new materials for laser technology, catalysis, etc. It also included some of the ideas on non-accelerator particle physics experiments. In the concluding part, a panel discussion, chaired by Dr J.P. Mittal, Director, Chemistry and Isotope Group, BARC, was held on new technological applications of lanthanides and actinides.

More than four hundred scientists including five foreign scientists from UK, Germany and France, participated in this symposium.

## TROMBAY SYMPOSIUM ON DESALINATION & WATER REUSE (TSDWR-99)

Board of Research in Nuclear Sciences of DAE organised a "Trombay Symposium on Desalination & Water Reuse (TSDWR-99)" in collaboration with the Indian Desalination Association (InDA) during December 2-3, 1999 at BARC. The symposium was inaugurated by Dr Anil Kakodkar, Director, BARC, and presided over by Mr B. Bhattacharjee, Director, Chemical Engineering & Technology Group, BARC. The symposium was attended by over 180 participants from industries, government organisations and academia, including six foreign delegates, representing the UK, Middle East, Russia, Israel and France.



*Dr Anil Kakodkar, Director, BARC, giving his inaugural address at the "Trombay Symposium on Desalination & Water Reuse-99 (TSDWR-99)"*

In his inaugural address, Dr Kakodkar emphasised the need for desalination and water reuse

technologies in the Indian context and cited BARC colony at Anushaktinagar, as one of the rare instances where zero discharge of aqueous wastes into the environment has been achieved. Mr B. Bhattacharjee recalled the efforts put in by BARC and other national laboratories in developing the desalination and water reuse technologies and informed the audience of the special features of 6300 m<sup>3</sup>/day Nuclear Desalination Demonstration Plant, being set up at MAPS, Kalpakkam, and its benefits to power reactor and the surrounding villages. The Plant would draw power, process steam and feed sea water from MAPS. He further informed that the plant was indigenously designed and all the components, excepting a few, were manufactured locally.



*Dr Anil Kakodkar, Director, BARC, and other senior officers of BARC at the exhibition organised during TSDWR-99*

There were six technical sessions in all and a panel discussion. During these sessions, different aspects on Thermal Desalination, Membrane Desalination, Desalination using Nuclear and Alternate Energy, Membrane Technology for Effluent Treatment & Water Reuse and Small Desalination Plants were discussed along with case studies. The discussions mostly pertained to cost and economics of the technologies. The symposium was concluded with a

Panel Discussion on the "Prospects & Potential of Desalination Technology in the Next Millennium". The discussions pointed to the fact that water reuse should be practised as much as possible because of low cost and reduced environmental burden. It was also emphasised that developments in desalination technologies should aim at reducing energy consumption and cost.

## TROMBAY SYMPOSIUM ON RADIATION AND PHOTOCHEMISTRY (TSRP-2000)

The fifth "Trombay Symposium on Radiation and Photochemistry (TSRP-2000)" was organised during January 12-17, 2000 at BARC, under the auspices of the Board of Research in Nuclear Sciences, Department of Atomic Energy, in collaboration with the Indian Society for Radiation of Photochemical Sciences (ISRAPS). TSRP is a biennial symposium held at Trombay every alternate year since 1992. About 300 registered delegates participated in the deliberation, including about 50 invited speakers and about 140 poster participants. About 40 foreign participants were from UK, France, Germany, US, Poland, China, Japan, Taiwan, Russia, etc.

The symposium was inaugurated by Dr Anil Kakodkar, Director, BARC, at the Central Complex auditorium, BARC, on January 12, 2000. Dr Tulsi Mukherjee, Head, RC&CD Division, BARC and Chairman, Symposium Organising Committee, welcomed the delegates and stressed the importance of TSRP series of symposia in view of as many as 5 Nobel Prizes in the last 12 years in the related areas. Dr J.P. Mittal, Director, Chemistry &

Isotope Group and Chairman of the National Advisory Committee, explained the basis of TSRP and asserted that it is now as popular as the Puls and Gordon Conferences or Tihany Symposium, while TSRP is the only forum where radiation and photochemistry are dealt together under one umbrella. While giving his inaugural address, Dr Anil Kakodkar, Director, BARC, praised the standard of research (to be presented in the symposium topics) in Indian laboratories, especially BARC. He specially mentioned some applied aspects of radiation and photochemical research, like development of hydrogel strips for treating burn injuries, wood polymer composites, radiation sterilisation, laser isotope separation, food irradiation, etc. He urged the young researchers to utilise the TSRP, forum for interacting with experts from India and abroad. Dr D.B. Naik, Convenor, TSRP-2000, proposed a vote of thanks and Dr H. Pal, Secretary, TSRP-2000, compered the function.



*Dr Anil Kakodkar, Director, BARC, addressing on the day of inauguration of the symposium*

Posters were presented in 3 sessions. Most of the posters were of excellent international quality. ISRAPS gave 6 cash awards and 8 certificates of merit for the 14 best posters as adjudged by an expert panel of judges. The invited lectures were in widely diverse areas like pulse radiolysis, pico- and femto-second laser spectroscopy, environmental

chemistry, reprocessing of nuclear fuels, treatment of water, generation, detection and application of nanoparticles, sub-picosecond accelerator technology, etc.

During the symposium, ISRAPs also honoured four outstanding Indian scientists, namely, Prof. Mihir Chowdhury, IACS, Calcutta; Prof. M.V. George, RPL, Thiruvananthapuram; Dr V.B. Kartha, Manipal Academy of Higher Education and Dr R.M. Iyer, Ex-Director, Chemical & Isotope Group, BARC. ISRAPs also brought out a special issue of its quarterly scientific bulletin. The TSRP-2000 was immediately followed by a Workshop on Radiation and Photochemistry (PUWOP-2000) organised at Pune University. A large number of BARC experts and TSRP participants attended the workshop.

The 6<sup>th</sup> TSRP will be held around January 2002. An international event, 3<sup>rd</sup> Asian Photochemistry Conference, will also be organised around the same time.

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## FORTHCOMING SYMPOSIUM

The Ninth National Symposium on Environment (NSE-9) is to be held during June 5-7, 2000 at Bangalore University, Jnana Bharathi, Bangalore-560 056. The symposium is being organised by Bangalore University under the auspices of Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy, which has been sponsoring the National Symposia on Environment every year since 1992. The symposium will focus on "Pollution in Urban Environment", an issue of serious concern as we enter the 21<sup>st</sup> century. The symposium will deal with a cross-section of topics dealing with monitoring

urban pollution, source identification, profiles of various sources, mitigation strategies, etc. The symposium will also feature several invited talks by eminent environmentalists. Other relevant areas that will be dealt with are :

- Air and noise pollution
- Solid waste management
- Environmental surveillance
- Environmental impact assessment
- Pollution mitigation strategies and regulatory aspects dealing with radioactive and non-radioactive contamination will be dealt with.

A separate session, dealing with various instrumental methods of air pollution monitoring including nuclear related techniques is planned.

Contact : Dr S. Sadasivan, Convenor, Technical Programme Committee, NSE-9, Bhabha Atomic Research Centre, Mumbai 400 085; E-mail: sada@magnum.barc.ernet.in; Fax : 022-550 5151

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## BARC SCIENTISTS HONOURED



Dr Hari Mohan, Head, Radiation Chemistry Section, Radiation Chemistry & Chemical Dynamics Division, has been elected as a Fellow of the National Academy of Sciences, India (Allahabad) for

his outstanding contributions in the field of radiation and photochemistry. He has also been elected a Fellow of the Maharashtra Academy of Sciences in 1998. He is a recipient of the BARCOA Science & Technology Award for Nuclear Science in 1993.



◆ Dr Vimal Kumar Jain of Novel Materials & Structural Chemistry Division has been selected for the S.S. Sandhu Memorial Endowment Lecture Award

for the year 1999. The award is given by Indian Chemical Society and consists of a citation and medallion.



Dr (Smt.) Abban M. Samuel, Director, Bio-Medical Group, BARC, was conferred the Special Contribution Award by FIE Foundation, Kolhapur, Maharashtra, in recognition of her

pioneering work in nuclear medicine. The award carries a cash amount of Rs. 35,000/-



◆ Dr Govind Prasad Kothiyal, Head, G&CTS, TP&PED, has been honoured in 1999 by a title of "Vigyan Vachaspati" by Vigyan Parishad

Prayag (Allahabad), a premier institution involved in science communication through the official language, Hindi, for his contributions towards science popularisation. Apart from his professional responsibilities, he is involved in popularising science through popular science articles, editorials, radio talks, compilation of science news for AIR, presentations in seminars and organising

seminars/symposia in Hindi language. He is presently the chief editor of *Vaigyanik*, a quarterly publication of Hindi Vigyan Sahitya Parishad, BARC, Mumbai. He is also life member of Hindi Vigyan Sahitya Parishad (BARC) and National Centre of Science communicators (Mumbai).



◆ Dr G.P. Das of Technical Physics & Prototype Engineering Division, BARC, has been awarded the Materials Research Society of India (MRSI) Medal for the year

2000. He was invited to the MRSI Annual Meeting at Baroda (February 2-5, 2000), to deliver his Medal Lecture entitled "Computational Materials Science - an emerging perspective". He was also been selected as the Chairman for the MRSI subject group on "Computer Design of Materials."



◆ Dr Madhab Chandra Rath of Radiation Chemistry & Chemical Dynamics Division has been selected for the sole award of "Dr R.C. Tripathy Young Scientist Award - 1999", by the Orissa Vigyan

Academy. This award is given annually to an Oriya scientist below the age of 32, with significant research contribution. The award consists of a citation and a medallion.

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