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AERB Newsletter

ATOMIC ENERGY REGULATORY BOARD

CONTENTS

From the Chairman's Desk 1
News 2
Certification of AERB in 9001:2000 Quality Management Systems (QMS) 3
Accreditation of Bio-dosimetry Laboratories 4
AERB's Safety Review 5
Training Activities 7
Safety Aspects in Heavy Water Plants - V.V. Pande, H.K. Kulkarni..10
Home Page 12

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From the Chairman's Desk

Towards enhancing the quality of its regulatory work, AERB decided in the beginning of 2006 to go in for ISO 9001:2000 certification. On 15 November 2006, AERB obtained ISO 9001:2000 certification for its Quality Management Systems related to the processes for Consenting, Regulatory Inspections and Development of Safety Documents. AERB is the first technical regulatory body in the country to have received ISO certification.

AERB strongly encourages interaction with various stakeholders on topics of mutual interest. Keeping this in view, a series of five workshops on Safety and Security of Industrial Radiography Sources were conducted during the year 2006 wherein a total of 373 practising professionals participated. Similarly a seminar on Radiation Safety and Regulations in Nuclear Medicine was organized in December 2006 to discuss various issues in nuclear medicine practices and their possible resolution. This event provided an excellent opportunity for intense interaction between the members of the Association of Nuclear Medicine Physicians of India (ANMPI), and the experts from AERB, BARC and Board of Radiation & Isotope Technology (BRIT). In addition, a Discussion Meet on Applications of Probabilistic Safety Assessment in Nuclear Power Plants (NPPs) and a workshop on Containment Structures of Indian NPPs were organized in August and December 2006 at Safety Research Institute (SRI), Kalpakkam and AERB, Mumbai respectively for the benefit of the experts in the respective fields. In the area of Industrial Safety, the 23rd Annual DAE Safety and Occupational Health Professionals Meet was held this year at Kochi and a National Symposium on Industrial and Fire Safety was held at Mumbai, both during November 2006.

The problem of very low level radioactive contamination in some of the consignments of steel products and steel components used in consumer products like leather bags etc. exported from India has surfaced recently. AERB has put in considerable effort in investigating these incidents to locate the source of the contamination. It is seen that contaminated imported metal scrap is the root cause. Accordingly, AERB has taken steps for educating the scrap metal recycle industry and the industries using recycled metal for making various steel products in the country as also by interacting with the Engineering Export Promotion Council and Leather Export Council. An article covering the salient aspects of this problem is presented in this issue. In the series of articles on safety aspects of various activities related to the nuclear power programme and the nuclear fuel cycle, this issue of AERB newsletter carries a write-up on the safety aspects in Heavy Water Plants. ●

(S. K. Sharma)

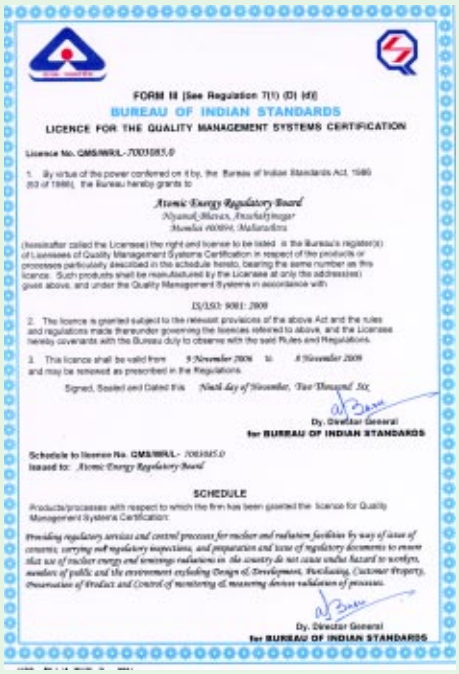
Press Release :

Wednesday, November 15, 2006

AERB OBTAINS ISO 9001:2000 CERTIFICATION

The Atomic Energy Regulatory Board (AERB) today obtained the ISO 9001:2000 Certification from the Bureau of Indian Standards (BIS). The certificate was handed over to Shri S. K. Sharma, Chairman, AERB by Shri A.S. Basu, Deputy Director General, BIS at a simple ceremony on 15th November 2006. The AERB was set up in 1983 on 15 November and this day is celebrated as AERB Day every year. AERB has the mandate to enforce rules and regulations promulgated under the Atomic Energy Act 1962 for protecting workers, members of the public and the environment from undue hazards of ionizing radiations. The ISO 9001:2000 Certification was awarded to AERB after detailed evaluation by BIS and ensuring that AERB's Quality Management Systems conform to the specified standards. These systems are used in AERB's Consenting Processes, Safety Review Procedures and Regulatory Inspections and in the Development of Safety Documents which lay down the regulations and norms for performance of various nuclear and radiation activities in the country.

The safety status of nuclear and radiation installations in India is comparable with the best in the world. This is achieved through maintaining highest standards by way of prescribing stringent regulations and conducting in-depth safety reviews and elaborate regulatory inspections of nuclear and radiation facilities in the country. In recent times, exhaustive review was done by AERB that led to implementation of several retrofits and safety upgrades in our older nuclear power plants at Tarapur, Rawatbhata and Kalpakkam and safety clearance for start-up and operation of TAPS Units 3&4, each of 540 MWe capacity that are completely designed and built through indigenous efforts. The nuclear power projects under review in AERB presently are Kaiga 3&4, RAPS 5&6 (each unit of 220 MWe), Kudankulam 1&2 (1000 MWe each) and the 500 MWe Prototype Fast Breeder Reactor under construction at the Kalpakkam site. In addition, safety review of Kakrapar- 3&4 (700 MWe each) and pre-licensing design safety review of the Advanced Heavy Water Reactor have also been initiated.



FORM III (See Regulation 7(1) (D) (d))

BUREAU OF INDIAN STANDARDS

LICENCE FOR THE QUALITY MANAGEMENT SYSTEMS CERTIFICATION

Licence No. CMS/WRL-7003085.0

1. By virtue of the power conferred on it by the Bureau of Indian Standards Act, 1986 (63 of 1986), the Bureau hereby grants to

Atomic Energy Regulatory Board
Niyamak Bhavan, Anushaktinagar
Mumbai 400094, Maharashtra

(hereinafter called the Licensee) the right and license to be listed in the Bureau's register(s) of Licensees of Quality Management Systems Certification in respect of the products or processes particularly described in the schedule hereto, bearing the same number as this licence. Such products shall be manufactured by the Licensee at only the address(es) given above, and under the Quality Management Systems in accordance with

IS/ISO 9001: 2000

2. The licence is granted subject to the relevant provisions of the above Act and the rules and regulations made thereunder governing the licencies referred to above, and the Licensee hereby covenants with the Bureau duly to observe with the said Rules and Regulations.

3. This licence shall be valid from *9 November 2006* to *8 November 2009* and may be renewed as prescribed in the Regulations.

Signed, Sealed and Dated this *Ninth day of November, Two Thousand Six*

Dy. Director General
for BUREAU OF INDIAN STANDARDS

Schedule to licence No. CMS/WRL- 7003085.0
Issued to: *Atomic Energy Regulatory Board*

SCHEDULE

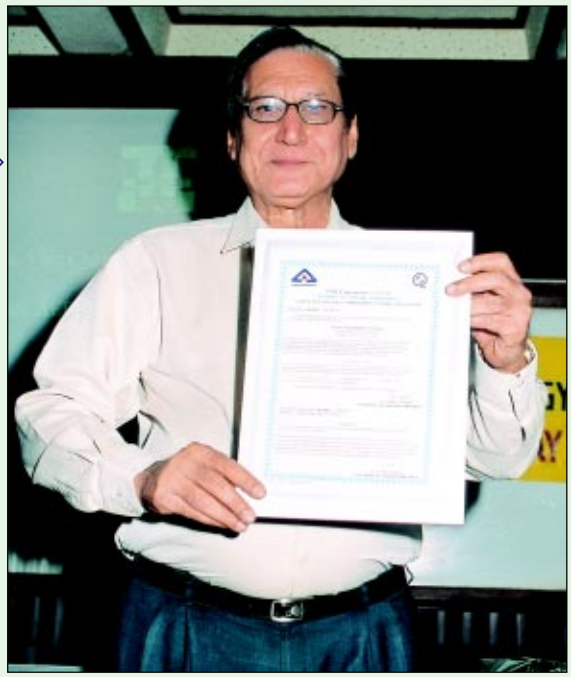
Products/processes with respect to which the firm has been granted the licence for Quality Management Systems Certification:

Providing regulatory services and control processes for nuclear and radiation facilities by way of issue of consents, carrying out regulatory inspections, and preparation and issue of regulatory documents to ensure that use of nuclear energy and ionizing radiations in the country do not cause undue hazard to workers, members of public and the environment excluding Design of, Development, Purchasing, Customer Property, Preservation of Product and Control of monitoring & measuring devices validation of processes.

Dy. Director General
for BUREAU OF INDIAN STANDARDS

The certificate ISO 9001 – 2000, for AERB.

Shri S. K. Sharma, Chairman AERB displaying the ISO 9001 – 2000 certificate, receiving from BIS on Nov 15, 2006.



AERB BOARD MEETING AT TARAPUR ATOMIC POWER STATION

The 89th meeting of the Atomic Energy Regulatory Board was held at Tarapur Atomic Power Station Site on August 28, 2006. The Board discussed the AERB activities since the 88th meeting and follow up actions on Board's recommendations. It also discussed the safety review status of projects and safety status of various DAE and non-DAE facilities. Chairman, AERB briefed the Board on AERB annual report: 2005-2006 and AERB's XI plan proposals.

Based on the recommendations of the respective Project Design Safety Committees and Advisory Committees on Project Design Safety, Board issued authorization to the following proposals:

- Construction of Interim Fuel Storage Building (IFSB) in FBTR Complex, Kalpakkam.
- Siting of Fast Reactor Fuel Cycle Facility (FRFCF) at Kalpakkam.
- Construction of Head End Facility (HEF) Building of Demonstration Fast Reactor Fuel Reprocessing Plant (DFRP), Kalpakkam.
- Erection of Major Equipment (EE) for KK-NPP-1&2, Kudankulam.
- Siting of Monazite processing plant at IREL, OSCOM, Orissa.

The members visited the Tarapur Atomic Power Station 3&4.

NEWS

CERTIFICATION OF AERB IN 9001:2000 - QUALITY MANAGEMENT SYSTEM (QMS)

Introduction

Realizing the importance of quality in the regulatory services rendered to the nation in the field of nuclear and radiation facilities, AERB management decided to get its activities audited for compliance with ISO 9001:2000 the Quality Management System (QMS) requirements. In order to familiarize the system to AERB employees and to understand the requirements for implementation of QMS, one officer from AERB was deputed for the "Lead Assessor Course for ISO 9001:2000"organised by National Centre for Quality Management, Mumbai". Subsequently a committee was constituted to study the feasibility of implementing ISO 9001:2000 in AERB through training, documentation, and preparatory arrangements for certification. The committee reviewed the available documents in AERB, vis-à-vis requirements of QMS and suggested the preparation of additional documents for implementing ISO –9001: 2000. The scope of activities / processes identified for ISO 9001: 2000 in AERB were

(i) Consenting Process for Nuclear and Radiation Facilities,
(ii) Regulatory Inspection of Nuclear and Radiation Facilities and
(iii) Development of Safety Documents (Codes, Standards and Guides).

Initiation of QMS process

Bureau of Indian Standard (BIS) was selected as the Certifying body for ISO 9001:2000 at AERB. A three days training was imparted to twenty-five officers of AERB during 12-14 December 2005 by Bureau of Indian Standards on the requirement of ISO certification. These officers formed core group for subsequent efforts for implementing the ISO requirements that included the preparation of necessary documents.

Documentation

For the certification of AERB in 'Quality Management System' three levels of documents were needed. The Level I document is the Quality Manual of AERB and the Level II documents are the regulatory Procedures on the following important activities of AERB:

- Consenting
- Regulatory Inspection
- Development of Safety Documents
- Control of Documents
- Control of Records,
- Internal Audit
- Control of Nonconformance
- Corrective Action
- Preventive Action
- Handling of Client Complaints
- Revision, Updating & Amendment and
- Document Numbering & Distribution

The various ***forms and formats*** required for these procedures are the Level III documents.

The Quality Manual of AERB was submitted to BIS along with the application for grant of QMS .BIS carried out adequacy Audit of AERB's Quality Manual in April 2006 and suggested few changes that were duly incorporated. All the level II 'Procedures' were finalized after thorough internal review and discussions. Quality objectives of different divisions of AERB were framed separately. 'Forms and Formats' were appropriately revised and master list of documents were revised as per the ISO specifications.

Implementation

A Management Representative and a Monitoring Committee was appointed for implementation of the ISO and also for periodic review of the performance of QMS. June 1, 2006 was considered as zero date for implementation of ISO 9001: 2000 in AERB and accordingly Chairman AERB, spelled out 'Quality Policy' of AERB. The policy was displayed at all prominent locations and circulated to all individuals for their information and awareness. An awareness programme on ISO 9001:2000 was conducted for all AERB staff in July 2006. To assess the preparedness and adequacy with respect to QMS documents, internal audits were carried out thrice during June - October 2006. Non-conformities with respect to the ISO procedures in various aspects such as - establishing of divisional documentation cell, document control officer, inward numbering of documents, client feed back information, appointment/authorization of inspectors, format for refusal of consent, approval/issue of documents and retention of documents were rectified.

External Auditing & Certification

Preliminary audit of QMS of AERB was conducted on September 29, 2006 by BIS and the suggestions given by BIS were appropriately incorporated. BIS carried out Certification Audit on October 30-31, 2006. No non conformity was raised during this audit. Based on the audit observations and satisfactory compliance with the requirements of the QMS, auditors recommended for ISO 9001: 2000 certification to AERB.

BIS awarded QMS - ISO 9001:2000 Certificate to AERB on November 15, 2006 which is celebrated as 'AERB day' every year since AERB was formed on this day in 1983. Chairman, AERB received the certification from BIS, Mumbai on behalf of the staff of AERB, in a glittering function organized at the Auditorium of Niyamak Bhavan, Mumbai. AERB is the first technical regulatory body to have received ISO 9001:2000 certification.

-- Report by K. Ramprasad & M. K. Pathak, Industrial Plants Safety Division, AERB

NEWS

Authorisations issued by the Board

- Authorization for Construction of Tailings Dam of Turamdih Ore Processing Plant of Uranium Corporation of India Limited (UCIL)
- Authorisation for Operation of Tarapur Atomic Power Project Unit 3 (TAPP – 3) upto 85% Full Power
- Erection of Major Equipment for Kudankulam Nuclear Power Project (KK NPP)
- Siting of 10, 000 TPA Monazite Processing Plant at Indian Rare Earths Limited, Orissa Sands Complex (IREL - OSCOM).
- Construction of Head End Facility (HEF) Building of Demonstration Fast Reactor Fuel Reprocessing Plant (DFRP) at Indira Gandhi Center for Atomic Research (IGCAR), Kalpakkam.
- Consent for Siting for Fast Reactor Fuel Cycle Facilities at Kalpakkam.
- Hot Conditionig and Light Water Commissioning of Kaiga Generating Station Unit –3 (KGS –3).
- Authorisation for Trial Operation of 750 keV DC Accelerator at Raja Ramanna Centre for Advanced Technology (RRCAT), Indore.

Committees constituted by AERB during January-June 2006

- Design Safety Review Committee for Diversification Projects (DSRC-DP)
- Project Design Safety Committee for Fast Reactor Fuel Cycle Facilities (PDSC-FRFCF)
- Advisory Committee for Project Safety Review of Fast Reactor Fuel Cycle Facility and Demonstration Fuel Reprocessing Plant (ACPSR-FRFCF)
- Committee for Developing Guidelines on Security Requirements during Transport of Radioactive Materials in Public Domain

Accreditation of Bio-dosimetry Laboratories for Assessment of Personnel Radiation Exposures

Biological dosimetry based on the chromosomal analysis has been used since mid 1960s for the estimation of accidental external exposures due to x-rays or gamma radiations. The technique has also been extensively used for investigation of suspected overexposure cases. In India, presently, such measurements are being carried out in only two laboratories of the Department of Atomic Energy (DAE) at BARC, Mumbai & IGCAR, Kalpakkam. Recently, it was considered that it would be advantageous if such measurements can be carried out in academic and private institutions also. All such institutions have to be accredited by an appropriate authority to ensure use of proper standards and quality assurance in the assessment of exposures. The Atomic Energy Regulatory Board is entrusted with the responsibility for laying down safety standards and framing rules, regulations and procedures covering regulatory functions envisaged under the Atomic Energy Act, 1962. AERB has therefore undertaken a programme of accreditation of laboratories carrying out biological dosimetry.

AERB has brought out a booklet titled Accreditation of Biodosimetry Laboratories for Assessment of Personal Radiation Exposures. This booklet describes the operational and technical requirements to be met by laboratories desiring accreditation for biodosimetric measurements. It also contains details of sample preparation, culturing, processing, scoring procedures, post accreditation responsibilities of laboratories and a format of the application for seeking accreditation.

Organisations interested in obtaining accreditation certificate in this context, may please write to the Head, Radiological Safety Division, Atomic Energy Regulatory Board, Niyamak Bhavan, Anushaktinagar, Mumbai – 400 094 for a copy of the Booklet. This booklet is also available on the AERB website, www.aerb.gov.in

One day Awareness Programme for Radiological Safety Officers Serving in Nuclear Medicine Laboratories in India

Radiological Safety Division (RSD), AERB had organized one day Awareness Programme for Radiological Safety Officers (RSOs) Serving in Nuclear Medicine Laboratories in India. The programme was conducted in two batches. The participants were physicians on nuclear medicine, technologists and medical physicists working as RSOs in nuclear medicine departments. The first programme was held in the V.G. Kulkarni Auditorium, Homi Bhabha Centre For Science Education, Mumbai and the next one in the AERB Auditorium. Forty two participants attended the first programme and sixty in the second programme. The first programme was inaugurated by Dr. Meera Venkatesh, Head, Radiation Physics Division, BARC while Shri S.K. Sharma, Chairman, AERB inaugurated the second programme.

Safety culture of any radiation installation can be improved with better performance of RSO. It is observed that handling of PET isotopes in nuclear medicine diagnosis such as molecular imaging and fusion imaging results in increase of occupational exposure compared to nuclear medicine practice with other isotopes and this is globally accepted these practices require enhanced safety control. The programme aimed to update the knowledge on radiological safety and also to provide overview of the upcoming challenges in the areas pertaining to handling of PET isotopes and the issues on radiation safety while operating medical cyclotrons. The findings of inspection carried out by AERB indicated poor control over the safe storage of radioactive sources, transfer of radio isotopes without permissions, workers handling radioactivity without TLD badges and higher contamination rate in working place. It was emphasized that the importance of RSO needs to be boosted for good safety practice and for effective implementations of regulatory measures. The programme was also intended to provide the RSOs with a better understanding of regulatory requirements related to nuclear medicine department in the light of Atomic Energy (Radiation Protection) Rules, 2004.

The programme comprised of one invited lecture by an eminent personality in nuclear medicine field followed by seven lectures on regulatory aspects, transport of radioisotopes, planning aspects in nuclear medicine and medical cyclotron facilities, operating experience for medical cyclotron, radiation emergencies in therapeutic nuclear medicine, QA aspects of nuclear

.....contd. in page 12

Radioactive Contamination in Steel Products

Introduction

Several Indian industries export a variety of steel products to different countries. In the recent past, there were incidents of rejection and return of exported steel products as they were found to be contaminated with trace quantities of radioactive materials. Atomic Energy Regulatory Board investigated these incidents and it was found that the products were made out of steel produced in foundries where imported metal scrap having slight radioactivity was recycled. Fortunately these were isolated incidents and the radiation levels detected in the contaminated steel were not high. However, there is always the possibility that material with higher contamination could also find its way in the metal recycle industry. Hence it is necessary that appropriate measures are taken to prevent such incidents in future.

Source of Contamination

Radioactive sources are used for wide variety of applications in Medicine, Industry and Research for societal benefits. These applications involve use of both sealed and unsealed sources with radioactivity varying from few kBq (micro Curies) to hundreds of TBq (thousands of curies). It has been observed that in-spite of regulatory control, there are incidents of theft, loss or abandoned radioactive sources all over the world. Such sources can get into metal scrap that are used by the steel recycling industry and thereby result in steel product with radioactive contamination. The incidents that came to the notice of AERB relate to the export of steel products such as steel door handle, man-hole covers, steel tension bars, steel wires and metal straps used for packaging, metal components used in leather bags etc.

Impact of radioactive contamination in steel

The radioactive contamination in the incidents in the past was too low to cause any significant hazard. Outside India, in some of the incidents that arose from abandoning of large sources used in medicine resulted in serious health hazards. In addition to the health hazard, it has large economic impact on the suppliers/exporters of such products because any radioactive contamination in steel products is not accepted in many of the importing countries. This not only results in loss of material cost but the manufacturer has also to bear the cost of transport and disposal of such rejected consignments. In addition, export of products contaminated with radioactivity brings a bad name to the country of export.

Preventive measures

For these reasons stated above, it is necessary to take preventive measures to avoid recurrence of such incidences. Radiation monitoring of scrap at entry point into the country and thereafter at different levels of value addition to metal scrap and its appropriate management can only prevent such incidents in future. Such checks should include

i) introduction of a procedure by which all importers of metal scrap obtain a certificate from the exporting country that the scrap is free from radioactivity;
ii) radiation monitoring after the import and prior to melting the scrap;
iii) radiation monitoring by steel mills prior to rolling of steel ingots into the desired shape and
iv) radiation monitoring by manufacturers and exporters of steel products prior to manufacture as also of the packaged products before export,

It is necessary that all concerned agencies in steel metal recycling industry such as metal scrap dealers, steel foundry owners, steel rolling mills and manufacturers of steel products, small or big, are advised to scan the material for presence of radioactivity with the help of radiation sensing devices prior to using it for value addition. If radiation is detected in any material, AERB shall be notified so that appropriate control can be instituted over the contaminated material.

Radiation survey meters, which can detect and measure low level radiation fields which are just above the natural background radiation level (5-10 microR/h), can be procured from local or imported sources. *Addresses of some of the suppliers of these instruments are given below.*

1. *Marketing Manager,*
   Electronic Corporation of India Ltd.,
   IDA, Cherlapalli
   Hyderaba - 500 062.
   Fax No. 040 27122784
2. *Managing Director*
   M/s Pulsecho Systems,
   110, Nirmal Industrial Estate,
   Sion Fort, Mumbai - 400 022
   Tel: 022-24071055,24092087
3. *Managing Director*
   Nucleonic Systems Pvt. Ltd.,
   Plot 162 A & B, IDA Phase II,
   Cherlapally, Hyderabad - 500 051
   Fax No. 040 27662146
   Tel No. 040-27265701
4. *PLA Electro Appliances Pvt. Ltd.,*
   Thakore Estate,Kurla-Kilol Road,
   Vidyavihar (West),
   Mumbai - 400 086
   Fax No. 022-5168948
   Tel No. 022-5116864
5. *Electronic Enterprises*
   Unit 216, 2nd floor, Regal
   Industrial Estate,
   Post Bag No. 6367,
   Acharya Dhonde Marg,
   Sewari, Mumbai - 400 015
   Fax No. 022-4133341
   Tel No. 022-4155894
6. *Rosalina Instruments*
   127, Bussa Udyog Bhavan,
   Tokershi Jivrag Road,
   Sewari, Mumbai - 400 015
   Fax No. 022-4168559
   Tel No. 022-4166630

Professional Associations such as All India Induction Furnaces Association and Engineering Export Promotion Council may play important role in preventing such incidences by

1. arranging radiation safety awareness programs related to the detection of radiation for the steel melting industry and other organizations such as steel mills and manufacturers of steel products,
2. developing a facility with trained man power and instruments to provide service of radiation monitoring for the needed industrys,
3. coordinate with AERB for disposal of the identified contaminated material and related matters.

Atomic Energy Regulatory Board has investigated all the incidents of radioactive contamination and segregated the contaminated products for their appropriate safe disposal. AERB also held meetings with Engineering Export Promotion Council and Leather Export Council to apprise their members on actions that need to be taken to prevent such incidents. Installation of portal monitors at all the entry ports of the country would also provide an additional precautionary measure and AERB has taken up this matter with the concerned Government Departments.

Industrial Safety Inspections Carried out in 2006		
Sr. No.	Units	Number of Inspections
1	Indian Rare Earths Limited, at Chhatrapur, Cochin, Chavara, Manavalakurichi	5
2	Uranium Corporation of India Limited, Jharkhand	2
3	Nuclear Power Plants- Tarapur, Kaiga, Kota, Madras, Narora (Operating)	11
4	Nuclear Power Projects- Tarapur, Kaiga, Kota and Kudankulam (Under construction)	4
5	Nuclear Fuel Complex, Hyderabad	2
6	Heavy Water Plants- Kota, Manuguru, Baroda, Hazira, Thal, Tuticorin, Talcher	7
7	Variable Energy Cyclotron Centre, Kolkata	2
8	Raja Ramanna Centre for Advanced Technology, Indore	1
9	Prototype Fast Breeder Reactor, Kalpakkam	1
10	Rajasthan Aomic Power Project Cobalt Facility, Kota	1
11	Fast Breeder Test Reactor / Kalpakkam Mini Reactor, Kalpakkam	1
12	Electronics Corporation of India Limited, Hyderabad	1
13	Special Monthly Regulatory Inspection to Construction Sites of Nuclear Power Projects at Kaiga 3&4, Rajastan 5&6, Tarapur 3&4, Kudankulam	16*
14	Beach Sand Mineral Industries (Kerala Metals & Minerals Ltd, Cochin Minerals & Rutile Limited and V.V. Mineral)	3
	Total	57

**Special Regulatory Inspections were carried out at the construction sites of Nuclear Projects at Kaiga 3&4, Rajasthan 5&6, Kudankulam, Prototype Fast Breeder Reactor & Demonstration Fast reactor Fuel Plant, Kalpakkam for emphasing on the industrial safety aspects particularly for 'safety in working at height' which is the major contributor of the accidents.*

Inspections carried out in 2006 by the Nuclear Projects Safety Division, AERB		
Sl	Projects	Period
1	Kaiga Generating Station -3&4	Jan /Feb '06
2	Kudankulam Atomic Power Projects	February '06
3	Tarapur Atomic Power Projects-3&4	March '06
4	Rajasthan Atomic Power Projects -5&6	March '06
5	Demonstration Fast reactor Fuel Plant, Kalpakkam	August, 06
6	Fast Breeder Reactor Project, Kalpakkam	August, 06
7	Kaiga Generating Station -3&4	September, 06
8	Kudankulam Atomic Power Projects	December '06

Workshop on Safety & Security of Industrial Radiography Sources

It has been observed that incidents involving theft, loss of radiography devices/ sources and their unsafe way of handling are increasing all over the world as also in India. The main reasons for occurrences of such incidents are inadequate physical security measures. The other reason for the incidents is operation of radiography devices without adhering to stipulated work procedures. To emphasize the need of strengthening physical security of radiography sources during storage/ transport and also highlighting the root causes of such incidents, the Radiological Safety Division (RSD) of the Atomic Energy Regulatory Board organized five workshops in a phased manner, on "Safety & Security of Industrial Radiography sources" in the year 2006, covering all radiography installations in India. The venue and number of participants for these workshops are as follows:

Date	Venue	Number of participants
16-02-06	AERB office Mumbai	70
30-06-06	AERB office Mumbai	85
18-09-06	Safety Research Institute, AERB, Kalpakkam	80
19-09-06	Safety Research Institute, AERB, Kalpakkam	85
24-11-06	AERB office Mumbai	53

In these five workshops, lectures were delivered on related topics and was focused to provide opportunity to industrial radiography agencies to interact with AERB, BARC, BRIT. Exchange of experience on their practices and clarifications on the regulatory requirements, physical security of radiography sources/devices were also covered.

Officers from Board of Radiation & Isotope Technology (BRIT), Radiological Physics & Advisory Division (RPAD), Bhabha Atomic Research Centre (BARC); RSD, AERB and Management Services Group (MSG) of Department of Atomic Energy (DAE), delivered the lectures. The presentations were on: regulatory requirements and unusual occurrences involving radiography sources; case studies; handling of radiological emergencies in industrial radiography; review of occupational over exposure cases in industrial radiography applications during the year 2004-2005 and quality assurance programme in industrial gamma radiography.

Panel discussions were arranged at the end of the workshop and issues brought out during the presentations were deliberated. The topics for panel discussion were role and responsibilities of licensee/employer and Radiological Safety Officer (RSO) in ensuring radiation safety and security in handling of Industrial Gamma Radiography Exposure Devices (IGRED), the role of RSO II for carrying out Quality Assurance checks of IGREDs before sending it for source replacement to BRIT, procedures for transport of IGREDs by road and air, minimum educational qualification of the trainee radiographer and certified radiographer, proposal to establish accredited laboratorys for calibration of radiation survey meters used in industrial radiography, use of imported old or refurbished radiography exposure devices in India, use of local made pigtails for all type of exposure devices etc. AERB is in the process of reviewing some of the procedures for industrial radiography based on feedback from these workshops.

One Day Seminar on Radiation Safety and Regulations in Nuclear Medicine

A seminar on 'Radiation Safety and Regulations in Nuclear Medicine' was organized by AERB on 28-12-2006 at AERB, Mumbai. The purpose of this seminar was to review current status of regulatory and radiation safety aspects of nuclear medicine practices such as requirements of qualified manpower, training and certification, facilities required in diagnostic and therapeutic centres, criteria for discharge of patients administered with radioiodine, release of corpses with high residual radioactivity and requirements for production and use of PET radioisotopes.

Around eighty persons from the field of nuclear medicine centres, physicians, senior technologists and RSOs participated.

The seminar had wide coverage on all safety and regulatory related topics including the issues raised by the Association of Nuclear Medicine Physicians of India (ANMPI). Speakers were drawn from ANMPI, private and government nuclear medicine centres, BARC and AERB. There were nine presentations on various topics and the seminar concluded with panel discussion followed by a feedback session. The relevant outputs from the seminar may be considered for incorporation during reissuing the Code on Nuclear Medicine Facilities.

Workshop on Containment Structures of Indian Nuclear Power Plants

Civil and Structural Engineering Division, AERB organized a workshop on "Containment Structures of Indian Nuclear Power Plants" on 18th August 2006 at AERB auditorium with the objective of discussing various aspects of containment structures of Indian PHWR based NPP. The Workshop provided a platform for technical discussions on different issues among the designer, consultant, contractor, operator and regulatory body.

Around 108 delegates which included personnel representing NPCIL head quarter, operating Nuclear Power Plants, Nuclear Power Projects, BARC, Consultants and AERB participated in the workshop.

In order to have focused discussion, presentations were selected from AERB and NPCIL covering design and construction, regulatory requirements, operating experience, safety status of containment structures of Indian NPPs and containment structures vis-a-vis exclusion zone. At the end a panel discussion was held to deliberate the issues raised during different presentations in order to identify recommendations for future improvement. It is expected that the outcome of the Workshop will provide input for improvement in performance of existing containment structures as well as design and construction of containment structures of future NPP.

TRAINING

Discussion Meet on Applications of PSA in NPP – Status and Future Directions

Probabilistic Safety Assessment (PSA) is being used as a complementary tool to deterministic safety assessment of nuclear power plants. Internationally, a limited or full scope PSA is in the process of becoming mandatory. At this stage it was considered prudent to assess the status of PSA in India. In this connection a discussion meet was held at SRI, Kalpakkam on 'Applications of PSAs in NPPs – Status and Future Directions' during August 10-11, 2006. Experts from different organizations of DAE and AERB exchanged views on the status, applicability and future directions for PSA in the Indian context.

The meet had six technical sessions comprising of presentation of seventeen papers. The topics covered in the technical sessions included Level 1 PSA, experiences and methods, hardware and software reliability, Level 2 and Level 3 PSA, regulatory aspects in PSA, external events PSA, techniques and tools.

The topics such as current status of PSA, its applications, identification of upcoming areas in near future and role of AERB in accelerating the use of PSA were discussed during the panel discussion. It was observed that significant progress has been made in PSA in last few years but some fields still need further development. Based on the panel discussion many priority areas such as Fire & Seismic PSA, Shutdown PSA and input data collection were identified for future work. A follow up meeting was held in November 2006 to identify the roadmap for carrying out these activities.

23rd DAE Safety and Occupational Health Professionals Meet

23rd DAE Safety and Occupational Health Professionals Meet was held at Kochi from November 1-3, 2006. The theme of the meet was "Legal Aspects on Safety, Health and Environment". Around 120 delegates participated in this meet. There were three technical sessions, three plenary sessions three parallel sessions and one poster session apart from the inaugural and valedictory sessions. The topics included Safety, Environment, Occupational Health, Injury and Occupational Health Statistics, Fatal Accidents, Environment Management Plans, suggestions for amendment to Atomic Energy Factories Rules, 1996, etc.

Refresher Course

Refresher Course for AERB staff was conducted with a series of lectures on "Fast Breeder Reactor Technology and Engineering Aspects of Prototype Fast Breeder Reactor" Three lectures in the series were organized. In-house faculty from AERB and faculty from Indira Gandhi Centre for Atomic Research delivered the lectures.

Colloquia

- 'Surveillance Requirements and Safety Issues for Reactor Pressure Vessel of WERs' by Dr. Milan Brumovsky from Czech Republic. Participants from AERB, BARC and NPCIL attended the program.
- Awareness program on 'ISO: 9001-2000' in connection with ISO: 9001-2000 certification for AERB. Important aspects like the concepts of Quality Management System, its applicability to AERB, documentation and implementation requirements of ISO, etc were addressed.
- 'Technology Independent Safety Criteria for Indian NPPs based on New Designs' by Dr. S.K. Gupta, Director, Safety Analysis and Documentation Division of AERB.
- 'Right to Information Act 2005' was delivered by Shri A. Ramakrishna, Information and Technical Service Division, AERB. The talk covered the background of Right to Information Act 2005, concept, objectives, processing of the applications and appeals under Right to Information Act 2005, implementation, etc.

Safety Research Programme

The 35th and 36th meetings of the Committee for Safety Research Programmes (CSRP) were held on 24th July 2006 and on 22nd December 2006 respectively. Eleven new project proposals were taken up for discussion and following six proposals were approved. Committee also approved the renewal of 6 on-going projects.

Sr. No.	Title of the project	Institution
1	Temperature Prediction of the Thermowell in the Core Temperature Monitoring System of Fast Breeder Test Reactor (FBTR)	Jadavpur University, Kolkata.
2	Evaluation of Patient Specific Doses for Optimised X-ray Diagnostic Imaging Systems in a Rural Setup	International Cancer Centre, Bhimvaram, AP
3	Investigations on Instabilities and Nonlinear Dynamics of Advanced Heavy Water Reactor (AHWR)	IIT Guwahati, Assam
4	Impact of Power Plant Entrainment on Zooplankton: Assessment of Thermal & Chemical Stress Effects on Copepods	The New College, Chennai
5	Development of a 3-D Space-Time Kinetics Model for the Analysis of Light Water Reactors	IIT-Bombay, Mumbai
6	Transfer Coefficient of Radio Strontium (Sr-90) in Food crops	Tamil Nadu Agricultural University, Coimbatore

REPORT ON NATIONAL SYMPOSIUM ON INDUSTRIAL AND FIRE SAFETY – 2006 (SIFS-2006)

With the enhanced importance of industrial safety and health for the sustainable development of industry and the considerable experience gained in the use of industrial safety in design, construction and operation of the major industrial units in the country, Atomic Energy Regulatory Board organized a National Symposium on Industrial and Fire Safety-2006 (SIFS-2006) during 27 and 28 November 2006 at Multi Purpose Hall, BARC Training School Hostel, Anushaktinagar, Mumbai, to share rich experiences in the field. The Symposium was co-sponsored by the Directorate General Factory Advice Service & Labour Institutes (DGFASLI), the National Safety Council (NSC) and the Directorate of Industrial Hygiene and Health (DISH), Government of Maharashtra. Industrial Plants Safety Division of AERB played the key role in organizing this symposium. The two-day symposium had six technical sessions and an exhibition of safety equipment and services.

The Symposium had overwhelming participation spanning length and breath of India, with around 240 delegates participating from the units of Department of Atomic Energy and from various other organizations such as Tata Chemicals, Cochin Shipyard limited, Defence Research Development Organisation, Indian Petro Chemicals Limited, Bajaj Auto Ltd etc. Dr. S. Banerjee, Director, Bhabha Atomic Research Centre (BARC) inaugurated the symposium.In his inaugural address he had laid profound emphasis on the development of safety as an independent scientific and engineering discipline citing day-to-day examples to stress that safety should be an integral part of the system. Shri S. K. Sharma, Chairman, AERB made a special mention about Shri P. K. Ghosh, the then Director, IPSD for his knowledge and contribution to industrial safety and as the prime architect of this symposium. Shri M. N. Gadappa, Director. DISH, Govt. of Maharashtra and Shri S. K. Saxena, Director General, DGFASLI, Govt. of India and Shri K. C. Gupta, Director General, NSC addressed the gathering. Shri S. K. Chande, Vice Chairman, AERB acknowledged the contribution of NSC, DGFASLI and DISH and their concern for safety in industries.

Dr. S.Banerjee Director BARC also inaugurated the exhibition where safety devices and personal protective equipment by various manufacturing agencies were displayed. In addition there were also stalls disseminating know-how and information on industrial safety services.

Technical Sessions had themes such as Construction/Electrical/Process Safety, Fire Safety in Nuclear industries and non-Nuclear industries, Unusual Occurrences, Risk Assessment and Safety Management/ Regulatory Aspects. In addition there were invited talks in each session from renowned experts who had several years of experience in their respective subject. Abstracts for the contributory papers from DAE and non-DAE organizations were received. Forty papers were selected for publishing of which thirty papers were short-listed for oral presentation. Five papers were adjudged as best papers by a three-member panel of judges from NSC, DGFASLI and DISH of which the first three best papers were awarded.

The Symposium ended with a feedback session and a panel discussion chaired by Shri M. S. R. Sarma, former Chairman, SARCOP, AERB. A proposal for formation of an Association of Industrial Safety Professionals of India (AISPI) was circulated among the delegates present during the Symposium. Majority of the responses received were in favour of formation of the Association and it was unanimously agreed to form AISPI. Subsequently a core group was formed comprising of members from DAE and non-DAE organizations to prepare the constitution and by-laws of the association.

– Compiled by Soumen Sinha & Diptendu Das, IPSD, AERB

⇧ Shri P. K. Ghosh, Director Industrial Plants Safety Division, AERB accompanying Dr. S. Banerjee, Director BARC for the inauguration function of SIFS 2006, on Nov 27, 2006.

⇧ A view of exhibition on safety devices / personal protective equipment and safety services at the SIFS 2006.

SAFETY ASPECTS IN HEAVY WATER PLANTS

V.V.Pande, H.K.Kulkarni, Industrial Plants Safety Division, AERB

Introduction

The Heavy Water Board (HWB) was established by the Department of Atomic Energy, responsible for setting up and operation of Heavy Water Plants (HWPs'), with the mandate of fulfilling the heavy water needs for nuclear programme of the country. Heavy Water Plants are basically chemical plants handling large volumes of, mainly Ammonia (NH_3), Hydrogen sulphides (H_2S).

Six Heavy Water Plants are spread all over the country; two plants at Kota & Manuguru are producing heavy water by Hydrogen Sulphide Water (H_2S – H_2O) bithermal isotopic exchange process & the other four plants at Thal, Hazira, Tuticorin and Baroda are producing by Ammonia – Hydrogen (NH_3 – H_2) monothermal isotopic exchange process. Recently HWP-Baroda has undergone major modifications and is operating with Water-Ammonia exchange process as 'front end integrated with the existing Ammonia – Hydrogen monothermal isotopic exchange process'. The HWP facility earlier producing heavy water by (NH_3 – H_2) bithermal process at Talcher has now ventured into the production of high quality organo phosphorous solvents namely, D2EHPA and TBP, which are used in the front as well as back end of nuclear fuel cycle. A coal based captive power plant is there at Heavy Water Plant (Manuguru) for in-house reliable supply of steam and power. All these NH_3 – H_2 based plants depend on the supply of raw material such as H_2/NH_3 from fertilizer plants set up neareby.

Heavy Water (D_2O) is a compound of an isotope of hydrogen called heavy hydrogen (Deuterium) and Oxygen. Deuterrium with atomic mass of 2 is present in hydrogen and hydrogen bearing compounds like water, hydrocarbons etc. with an abundance varying between 100-150 ppm depending on the source. The deuterium is recovered at HWPs from water in H_2S – H_2O isotopic exchange process and from hydrogen in NH_3 – H_2 isotopic exchange process.

Heavy Water Production by Hydrogen Sulphide Water (H_2S-H_2O) Exchange Process

These plants handle bulk quantities of H_2S gas. H_2S is highly toxic (TLV 10 ppm), corrosive & flammable (LEL 4.3%, UEL 46 % v/v in air, Auto ignition temperature 260 deg C). Other chemicals such as Cl_2, acids, alkali & various fuels – coal, furnace oil, etc. are used.

Water from nearby rivers is purified from impurities and used as process feed to Exchange Units where D_2O content is enriched from 150 ppm (.015%) to 15% by H_2S – H_2O Chemical Exchange Process and later vacuum distilled to produce 99.8% D_2O.The Exchange Unit is arranged in a three stage cascade consisting of three pairs of cold and hot towers operating at 30 deg. C. and 130 deg. C. respectively with gas in closed circuit in the pairs of cold and hot towers. The purified water enters the top of cold tower and travels down while H_2S gas entering the bottom of the tower meets the water on tower internals and exchange of deuterium takes place and the water gets enriched with respect to deuterium while gas gets depleted in deuterium concentration. In hot tower, the reverse reaction takes place viz.the gas gets enriched in deuterium. Finally the deuterium-enriched water from the 3rd stage is stripped off its H_2S in a product stripper and fed to the distillation unit for further enrichment upto nuclear grade.

Heavy Water Production by Ammonia Hydrogen (NH_3 – H_2) Exchange Process

These plants handle large quantities of Ammonia, which is toxic (TLV 25 ppm), synthesis gas (Mixture of N_2 + $3H_2$) that has potential hazard of explosion (LEL 4%, UEL 74 % v/v in air) & potassium amide at very high pressure and temperature ranging from -25°C to 600°C and also handies hexane, Potassium metal, biocides, natural gas/naphtha & various other chemicals.

The separation factor of the isotopic exchange process is temperature and pressure dependent. The lower the temperature and higher the pressure, higher is the separation factor. The synthesis gas from the fertilizer plant at a pressure of about 650 ata is fed to cold tower from bottom and transfers its deuterium to a counter current stream of liquid ammonia and potassium amide fed from top of the column. There is a net downward transport of deuterium and the enriched ammonia from the bottom of cold tower is fed to top of another tower for further enrichment through exchange from stream of enriched synthesis gas obtained by cracking of enriched ammonia. The top depleted gas is passed through a ammonia converter to obtain ammonia for the process. A portion of this liquid and gas is taken for final enrichment and exchange of deuterium to water forming nuclear grade heavy water.

Safety Design Features of Ammonia based Heavy Water Plants

The design features dominantly take care for prevention of fire hazards arising out of handling flammable gases, overpressurisation, and minimizing danger due to release of ammonia and hydrogen from the system. Over pressurization of high and medium pressure loops are prevented by safe discharge of gases to high vent stacks by operation of the remote operated control valves. NH_3/H_2 detectors have been provided in the plant.

Safety Design Features of Hydrogen Sulphide based Heavy Water Plants

The H_2S based plants are designed with the design principle of zero leaks in normal operating conditions. Continuous monitoring of H_2S is done through H_2S monitors installed at various locations in and around the plant (within 5 km radius). The villages within the 5 km radius are provided with H_2S monitoring, shelters & phone facility to communicate to control room of plant in case of H_2S in air. During emergencies, there is a provision for taking emergency shut down of the of exchange units. The H_2S in the affected section of the plant can be isolated and gas dumped and safely disposed to flare stack by close vent and flare systems at elevation of 126 mts. where in the gas is burnt and released to the atmosphere. To defeat the corrosion and malfunctioning of safety valves internals, rupture discs are provided on upstream of the safety valves in H_2S systems. There is a facility provided for transferring of H_2S to the H_2S storage tanks

from all exchange units during requirement of depressurization of the units. Liquid effluents with dissolved H_2S are drained to effluent treatment plant through closed drains systems.

Safety & Environment Systems

Heavy Water Plants Safety & Environment Systems are well engineered and equipped with limiting conditions for operation and on-site/off-site emergency preparedness plan for safe operational control and effective emergency handling. Both the processes involve handling of gases that are highly toxic, flammable & corrosive. Heavy Water Plant sites are located in thinly populated area to minimize the risk of exposure of toxic chemicals to the public. The main plants are open structures thereby minimizing accumulation of hazardous gases by natural dispersion. The units are classified as hazardous and non-hazardous - that can be easily isolated from each other. The in-built safety systems have been designed and incorporated in such a way that during emergency situation the affected portion of plant can be temporarily shut down in a controlled manner to bring plant to safe condition within shortest possible time.

Industrial Safety Aspects

All HWPs have dedicated Safety Organisations looking after industrial and fire safety. The safety related unusual occurrences are reported to AERB and are discussed in the Heavy Water Plants Safety Committee and the recommendations made by the committee are implemented at the plants. The injury indices (which are the products of frequency rates* and severity rates* divided by 1000) for HWPs over last 5 years are given below which indicates a good safety performance of the plants.

Safety Review and Regulation by AERB

AERB carries out safety review of HWPs projects during siting, construction, commissioning and operation stages and accordingly issues regulatory clearances. The safety review followed by AERB is a three-tier process. For operating plants, the safety related issues are first discussed in Heavy Water Plants Safety Committee and subsequently in Safety Review Committee for Operating Plants (SARCOP) and the Board.

Year	Man-hours worked	Frequency Rate	Severity Rate	Injury Index
2001	12087111	0.248	7.032	0.0017
2002	13288922	0.526	472.76	0.2486
2003	13375192	0.449	13.08	0.0059
2004	13962243	0.14	16.19	0.0023
2005	13519212	0.29	9.423	0.0028

* *Frequency rate - number of lost time injuries per million man-hours worked*

** *Severity rate - number of man-days lost per million man-hours worked*

The safety surveillance and monitoring of all Heavy Water Operating Plants is done by regulatory inspection on industrial and fire safety aspects under the Atomic Energy (Factories) Rules, 1996 and enforcement to ensure the compliance of applicable regulatory requirements and stipulations laid down by AERB.

All Heavy Water Plants have implemented a detailed surveillance program as stipulated in AERB approved technical specifications of the plant and the records are checked during regulatory inspections of AERB.

In order to provide an assurance against failure & input for plant life extension and check degradation of plant HWPs have implemented In-Service Inspection Programme (ISI) approved by AERB. The ISI records are checked during regulatory inspection.

The licensing committee for Heavy Water Plants constituted by AERB assesses and authorizes the operating personnel for operation of Heavy Water Plants.

The Safety Related Unusual Occurrences are discussed in the Safety Committees of AERB and consequently AERB imposes stipulations to prevent recurrences of such incidents. Following are the significant incidents investigated by AERB:

- failure of outlet hairpin of cracker tube in HWP-Baroda,
- breach of Ash Pond at HWP-Manuguru.
- aerial ropeway failure at HWP-Manuguru,
- ammonia leakage due to isolation valve gland packing assembly at Heavy Water Plant-Baroda

Licence under the Factories Act, 1948 is issued by AERB to HWPs for a period of five years for production of Heavy water, Potassium metal, Di-Ethyl Hexyl Phosphoric Acid and Tri- Butyl Phosphate etc. In future for renewal of licence of those plants which are operating for more then 20 years, AERB has deviced a detailed assesment of plants status of performance of in-built safety systems towards ageing management.

Waste Management

All HWPs are required to follow the statutory requirements of State Pollution Control Board. The effluent analysis records are checked during regulatory inspections by AERB. Wastes like Calcium Fluoride Slag in HWP-Baroda, Sour Oil (H_2S contaminated oil from compressors at HWP-Kota & Manuguru) etc. are stored/ handled at the plants as per the Hazardous Waste (Management and Handling) Rules. Fly ash generated from captive power plant at HWP-Manuguru is being used for manufacturing bricks. A process has been developed for treatment of sour oil for reuse as seal oil.

Conclusion

The Heavy Water Plants have their well-engineered safety & environmental systems, standard operating procedures, operation by authorised operating personnel, emergency plans and in-service inspections programme and the safety surveillance by AERB. This works to ensure that workers, the members of public and the environment are not subjected to any undue hazards by operation of these plants.

HOME PAGE

AERB DAY CELEBRATIONS

The 2006 AERB Day was celebrated in two phases on November 15, 2006 and November 25, 2006 at the AERB Auditorium. On Nov 15th, the date on which AERB was formed in 1983, AERB received the ISO 9001:2000, Quality Management System Certification from the Bureau of Indian Standards. A technical talk was also delivered by Shri G. R. Srinivasan, former Vice Chairman AERB, on 'My Quality Experiences'.

The second phase of the celebration on November 25 comprised of a cultural programme. Around 300 AERB staff and their family members graced the occasion. Shri V.P. Gholap, Secretary, AERB Staff Club and Shri A. Ramakrishna, President AERB Staff Club welcomed the gathering and presented the account of the work done by the staff club during the past year. This was followed by prize distribution to the winners of the cultural and sports tournaments conducted by Staff Club in 2006. The cultural programme included dances, songs, skits, memory games, etc. participated by the AERB staff and their family members. A grand musical programme with golden old songs and current popular songs was presented by Shri S. Bhatnagar, a well known vocalist and an employee of Heavy Water Board.

⇧ Participants of cultural programme for AERB day celebration, receiving prizes from Shri. S. K. Chande, Vice Chairman, AERB.

From page 4

One day Awareness Programme for RSO .....

medicine equipment, occupational and public exposures from nuclear medicine. The inaugural lectures were delivered by Dr. A. Malhotra, Head, Nuclear Medicine Department, AIIMS, New Delhi on "Clinical Aspects of PET Imaging" and by Dr. B.A. Krishna, Head, Nuclear medicine Department, P.D. Hinduja Hospital, Mumbai on "Impact of PET Imaging on Clinical Decision Making". A panel discussion and feedback was held at the end where queries made by the participants were clarified.

A musical concert on AERB day. ⇨

Safety Documents published by AERB during July – December 2007 in Hindi

Design of Fuel Handling and Storage Systems for Pressurized Heavy water Reactors (AERB/SG/D24)

Personnel Joined / Retired during July – December 2006

Name	Designation	Division	Retired/ Joined
Shri P. K. Ghosh	OS	IPSD	Retired
Shri A. N. Nandakumar	SO/H	AERB	Retired
Shri Nilesh Agrawal	SO/C	SRI	Joined
Shri K. Obidur Rahman	SO/C	ITSD	Joined
Kum. Sharmin Shaikh	SA (B)	OPSD	Joined
Shri Milind S. Mestry	SO/C	OPSD	Joined
Shri Parikshat Bansal	SO/C	OPSD	Joined
Shri Swayam Mallick	SO/C	SRI	Joined
Shri Arun Aravind	SO/C	SRI	Joined
Smt. Sunita S. Haryan	LDC	Accounts	Joined
Shri G. Yesu Ratnam	Steno III	OPSD	Joined
Shri Kishore A. Morey	Steno III	SRI	Joined

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