

Founder's Day Address

By

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Part 1

Dr. Sekhar Basu, Chairman, AEC, Senior Members of the DAE Family, Distinguished Invitees, Representatives of the Media, my dear Colleagues, Ladies and Gentlemen-It is indeed my pleasure and proud privilege to extend very warm greetings to all of you on the occasion of the Founder's Day of BARC.

It has been our tradition to pay respectful homage to our visionary Founder, Dr. Homi Jehangir Bhabha, on his birth anniversary, the 30th of October every year. Today is the 108th Birth Anniversary of Dr. Homi Bhabha.

For me – in fact for all of us- this is one of the most important days in the Institution's calendar. It is a day when we remember the founder and the value of his legacy, and a day when we express our gratitude to the great man who had the vision that led to the creation of this great institution.

Founders' Day is extremely important for other reasons as well. It is a day on which we celebrate our many achievements, individual and collective. It is also an occasion for honest introspection to assess our performance, recalibrate our objectives and forge ahead with sincerity and dedication, striving to deliver the maximum benefits from the application of nuclear science and technology to the nation and its people.

Part 2

Dear Colleagues, as you are all aware, the programmes of BARC encompass a wide array of activities. The comprehensive DAE Vision Plan, which envisions a broad based mandate with 10 principle domains of delivery, has been our guiding principle

I shall now be briefly highlighting some of the major activities and achievements of the past year, to offer a glimpse of the range and breadth of our successes and accomplishments.

A. I shall begin by highlighting the major activities in reactor operations, reactor design, fuel fabrication etc.

1. Full scope computer based real-time engineering simulator for Advanced Heavy Water Reactor (AHWR) has been developed. This simulator will be used for fine-tuning of plant control algorithms, validation of C&I systems and operator training in Integrated Test Station (ITS).
2. The production of Dhruva fuel has been sustained to ensure that the required demand is met. New ECT equipment has been deployed to facilitate flaw detection.
3. Refurbishment of old PIE hot-cell has been completed and it has been operationalized.

B. BARC continues to provide the required technical support to NPCIL

1. TAPS-1 reactor pressure vessel was inspected using BARC Vessel Inspection System, called '17mm BARVIS', which needs to operate in very limited space. The probe holder has been designed using custom made probes with increased degrees of freedom for better surface contact.
2. Modifications have been recommended in the fabrication routes of Zr-Nb alloy pressure tubes. The tubes are being manufactured at NFC for KAPS 1 and 2 reactors.

C. Significant deliverables and landmarks have been achieved at the back end in the area of Fuel Reprocessing and Waste Management, which are as follows:

1. Six batches of carrier-free ^{90}Y were delivered to RMC for radiopharmaceutical applications.

2. A process for treatment and management of Tc-99 containing low-level waste was developed and demonstrated on pilot scale.
3. Production trials for the production of various alloys of Zirconium, Steel and Aluminium have been carried out by induction skull melting.
4. Strontium selective ligand was synthesised and successfully demonstrated for recovery of Strontium from simulated HLW. The ligand was found to be comparable to expensive equivalent imported ligand.
5. Computational Fluid Dynamic (CFD) based model to predict hydrodynamics and mass transfer in solvent extraction contactor with a pulsed column) used in back-end of the nuclear fuel cycle was developed and validated with real time plant data. The model is useful for design optimization and scale up of the contactor which is the heart of reprocessing plant.
6. A new Solid Waste Compactor having a capacity of 200 Te was commissioned at CWMF Kalpakkam and its regular operation has reduced the solid waste disposal volume by about 50%.
7. At WIP Kalpakkam, DBP-bearing ILW generated from Reprocessing Plant has been treated successfully for the first time on plant scale by Ozonisation process.
8. Green heating of India's largest Joule Heated Ceramic Melter (JHCM) - a step towards active operations for vitrification of HLW at Kalpakkam- is nearing completion.

D. Being one of our important mandates, we have made special efforts in developing and deploying several technologies for societal applications.

1. Pre commissioning trial runs of the Sludge Hygenisation Facility at Ahmedabad have commenced prior to source loading. A second MOU has also been signed to set up 100 tons/day capacity facility at Indore. It is noteworthy that this technology is being identified as one of the significant contributors to the Smart Technology for Smart Cities initiative under the Swachh Bharat Abhiyan.

2. Indigenously developed radon monitoring geostations have been set up at 15 locations of the country for earthquake precursory studies. The results have been encouraging and it is proposed to increase the number of monitoring geostations to increase the database and to understand earthquake predictability.
3. ^{131}I -Lipiodol, a low cost radiopharmaceutical for the treatment of liver cancer (primary hepatocellular carcinoma -HCC) has been developed and transferred to BRIT.

E. Development of instruments and techniques for in-house applications as well as for applications in various sectors has been one of our strengths and during this period, several programmes have reached maturity.

1. Integration of all the systems for a portal type Cargo Container Scanner has been completed at Trombay. This is the first scanner in the country using an indigenous Compact 6 MeV RF-LINAC based X-ray source. Evaluation trials are in progress.
2. A Crystal Growth system has been delivered to the ECIL Hyderabad for the commercial production of Cesium Iodide single crystals, which are used as radiation detectors in various applications involving X-rays and gamma rays.
3. A 'Thermal Ionization Mass Spectrometer' has been designed, fabricated and delivered to the 'Kalpakkam Atomic Reprocessing Plant'. This machine will be used for the isotopic ratio measurements of Uranium and Plutonium samples.
4. A 50kW, variable frequency (2-3kHz) Induction Heating Inverter for nuclear waste immobilization through verification process has been developed. Ten units were manufactured at ECIL, delivered and commissioned with induction furnaces at WIP, Trombay.
5. A bio-film based granular biotechnological solution for remediation of organics was developed. The bioprocess effectively removes butanol, an organic compound in the effluent of TBP plant (HWB), up to 15000 mg/l - 1 in the presence of 4.0% salt concentration.

6. A hydrometallurgy process flow sheet has been developed for recovering heavy rare earths and Yttrium from thermal power plant fly ash.
7. Carbon Nanotube-Boron Carbide and Graphene-Boron Carbide composites with improved fracture toughness have been developed for various applications.
8. An Integrated Environmental Radiation Monitor with Autonomous Vertical Profiler (ERM-AVP) for Underwater Radiation Monitoring upto a depth of 200m has been developed and field tested in collaboration with National Institute of Oceanography (NIO), Goa.

F. The directed R&D initiatives have resulted in numerous systems and processes for practical applications

1. A portable dissolved oxygen monitor, with detection range of 5 ppb to 8.0 ppm, has been developed and demonstrated for its functional utilization in nuclear power plants, and industrial wastewater samples.
2. A prototype carbon chemical with fully automated software has been developed for analysis of carbon and sulphur in solid samples with detection range of 10 ppm to 1% for Carbon and 10 ppm to 0.5% for Sulfur.
3. An automated high temperature dilatometer, operational from room temperature to 1100°C, has been developed to measure thermal expansion of materials such as nuclear materials, ceramics, polymers, composites, etc.
4. A new neutron powder diffractometer with a multi-detector system, consisting of ³He neutron position sensitive detectors, has been installed and commissioned at the beam hole TT-1015, of Dhruva reactor, Trombay under National Facility for Neutron Beam Research (NFNBR). The diffractometer is now available for in-house as well as external researchers for the investigation of magnetic materials over a temperature range of 2-320 K.
5. A process has been established for preparation of super-hydrophobic and highly transparent PTFE (Polytetrafluoroethylene) thin films by Electron Beam evaporation. This has potential applications as coatings

on solar panels for introducing anti-reflection and self-cleaning properties.

6. A high purity germanium crystal has been successfully processed at TPD to fabricate a gamma-ray detector exhibiting an energy resolution of about 0.5% at 662 keV from a Cs137 source.
7. A technology for cold plasma based transfection system (for introduction of drugs/biomolecules into the cell) was developed and has been transferred to a bio-technology equipment manufacturer.

G. The technical expertise of BARC has been leveraged towards the development and deployment of various technologies of national and strategic importance. One of the example is:-

1. Technology of lightweight ballistic resistant jacket Bhabha Kavach has been transferred to MIDHANI and approved by Ministry of Home Affairs for use by Central Armed Police Forces.

H. A safe, robust and modern IT infrastructure is an essential requirement for any organization. BARC has been at the forefront of developing state of the art technologies in networking, communications and security systems.

1. A hand-based multi-biometric fusion system for personnel identification and verification has been developed and tested. The patented technique can be used as an additional layer of security at strategic assets.
2. 24x7 availability of the digital resources of SIRD hosted on the Lakshya and Saraswati platforms has been enabled by extending access to these portals outside the campus as well through the 'Home Office or Anywhere' and 'Secure VPN Anunet Users' facilities respectively. This lets the users carry the library digital resources with them wherever they go.

- I. **The augmentation and upgradation of infrastructural facilities to support our activities is crucial for the satisfactory performance of our centre.** The New Engineering Halls 9 and 11, New Animal House along with Bhabhatron facility at Gamma Field, North Gate Entry Portal

with the identity validation system and the Solar Roof Top PV based power generation plants for CFB building and Modular laboratories are some of the major infrastructure projects completed during this period.

Under BARC Employees' Family Relief Scheme, the relief amount has been raised to Rs.1,75,000/- per event from the present figure of Rs.1,60,000/-

Part 3

Dear Colleagues,

Within the time available, I have only been able to describe in brief a few of our major achievements. These and many other achievements-small and big- have been made possible due to the sustained efforts of our scientists and technologists and I take this opportunity to acknowledge the role played by every individual, group, section and division who have contributed collectively to this magnificent team effort. The outcomes prove beyond doubt that the whole is much more than the sum of the parts.

It is also important to acknowledge the sterling role played by the auxiliary services- Medical Division, Administrative Group, Engineering Services Group, Landscape and Cosmetic Maintenance Section, Fire Services, BARC Security and CISF, who are responsible for our well-being and provide the backbone support structure, aesthetic surroundings and a safe and secure environment required to carry forward such a large and varied mandate.

I also thank members and office bearers of associations and unions for their support and cooperation for making our achievements possible.

Dear Colleagues, it is important to celebrate the notable achievements of the past year, for it instills a sense of pride in all of us. However, it is also important that we remain humble. The targets, goals and deliverables defined by us should at all times remain firmly on our radar in order to meet the vision and objectives of the organization. This would need sustained

focused and accelerated efforts from each one of us, in a manner commensurate with the expectations and traditions of BARC. It is my earnest appeal that the adage -'Excellence is a habit and the result of consistently maintaining high intentions, sincere efforts, and intelligent execution' should unfailingly be reflected in the work ethics and ethos of our organization.

Thank you and Jai Hind