

# BRIT-DAE Annual Report 2015-2016

## *Executive Summary*

Board of Radiation & Isotope Technology (BRIT), the unit of DAE, is focussed on bringing the benefits of the use of radioisotope applications and radiation technology across industry, healthcare, research and agricultural sectors of the society. Harnessing the spin-offs from the mainstream programmes of DAE, such as R&D programmes at BARC and Nuclear Power plants for generating electricity by NPCIL, BRIT has independently created a separate visible area of contribution to the society.

## **A. Products**

### I. Healthcare Products

#### **(a) Radiopharmaceuticals Production (RphP)**

- More than 20,000 consignments of ready to use Radiopharmaceuticals of Sodium Iodide ( $\text{Na}^{131}\text{I}$ ) in the form of both, solution and capsules, for diagnosis and therapy of thyroid disorders,  $^{131}\text{I}$ -meta Iodo Benzyl Guanidine (mIBG), for neuroendocrine tumor detection & therapy,  $^{32}\text{P}$ ,  $^{153}\text{Sm}$  and  $^{177}\text{Lu}$  for bone pain palliation were supplied to various nuclear medicine centres & hospitals all over India in the form of ready-to-use injectables.
- Total numbers of therapeutic treatments based on supplies are estimated to be more than 20,000. This major product includes doses of  $\text{Na}^{131}\text{I}$  for treatment of thyroid cancer & hyperthyroidism.
- More than 75,000 cold kits for the formulation of  $^{99\text{m}}\text{Tc}$ - Radiopharmaceuticals (15 products; BRIT Code-TCK) were supplied to nuclear medicine centres.
- Approx 71.5 Ci of Sodium Molybdate ( $\text{Na}^{99}\text{MoO}_4$ ) solution in 342 consignments, for solvent extraction generator is supplied upto December 2015. A total of 377Ci of  $^{99}\text{Mo}$  (1069 Consignments) in the form of sodium molybdate is supplied as  $^{99}\text{Mo}$ - $^{99\text{m}}\text{Tc}$  generators (both Gel and Coltech) to various nuclear medicine centres.
- Medical Cyclotron Facility (MCF), Parel, continued the supply of Positron Emitting Tomography (PET) radiopharmaceuticals such as  $^{18}\text{F}$ -FDG,  $^{18}\text{F}$ -NaF and  $^{18}\text{F}$ -FMISO to various hospitals in and around Mumbai. Approx 15,000 patients were benefited.
- Approx 3,000 Radioimmunoassay (RIA) and Immunometric Assay (IRMA) kits to carry at about 5,00,000 in-vitro investigations, were supplied to various hospitals, research centres and immunoassay laboratories throughout India.
- **Approximately 2,45,544 In-vivo diagnostic investigations are estimated to have been carried and this year with varied diagnostic Radiopharmaceuticals, the major are  $^{99\text{m}}\text{Tc}$  based cold kits and  $^{99}\text{Mo}$ -  $^{99\text{m}}\text{Tc}$  generator systems.**

## **(b) Quality Control Analysis & Quality Assurance of Radiopharmaceuticals (Allied Services to RPhP):**

- Around 600 radiopharmaceuticals samples were analysed and certified by Quality Control section before despatch to nuclear medicine centres.
- Biodistribution studies (6 batches) were performed for Macro Albumin Aggregates (MAA) for lung scan. Similarly these studies were performed for newly launched kits such as  $^{177}\text{Lu}$ -EDTMP and  $^{99\text{m}}\text{Tc}$ -TRODAT.

## **(c) Labelled Compounds (LC)**

- Labelled compounds Programme of BRIT continued the synthesis and supply of a variety of  $^{14}\text{C}$ ,  $^3\text{H}$  and  $^{35}\text{S}$ -labelled products and various types of Tritium-filled self luminous sources (TFS). Since April 2015, approximately 7500 TFS sources of various sizes and shapes were supplied to defence establishments.

## **II. Engineering Products**

### **(a) Sealed Radiation Sources**

- Eleven teletherapy sources (CTS) containing 98,300 Ci of  $^{60}\text{Co}$  were supplied to different cancer hospitals upto December 2015.
- Sixty six Irradiator sources in seven consignments with total activity of 10, 66,498 Ci were supplied to various radiation processing plants within the country and also exported.
- More than 850  $^{192}\text{Ir}$  &  $^{60}\text{Co}$  Radiography sources containing 37,460 Ci of activity was supplied to NDT users. Reference and custom made sources (CMR) of  $^{46}\text{Sc}$  and  $^{137}\text{Cs}$  in 975 consignments containing 5.67 Ci of radioactivity were also supplied to various organizations.

### **(b) Radiation Equipments**

- 81 Radiography Cameras, ROLI-2 and ROLI-3, were supplied to various NDT users within India.
- One Blood Irradiator containing 800 Ci of  $^{60}\text{Co}$  was supplied was supplied to Ruby Hospital, Pune.
- **First  $^{137}\text{Cs}$  based Blood Irradiator is manufactured during this period.**



## **B. Services**

### **I. Consultancy and MoU for Radiation Processing Plant**

- MoU for setting up Radiation Processing Plants was signed each with M/s Avantee Mega Food Park Pvt. Ltd. at Indore, M/s Electro Magnetic Industries at Sinnaur, Vadodra, Gujrat, M/s. Maharashtra State Agricultural Marketing Board, Vashi Navi Mumbai.
- M/s Aligned Industries Pvt. Ltd. commissioned Radiation Processing Plant for processing food and medical products at Dharuhera, Haryana.
- Four more Radiation Processing Plants under MoU with BRIT have been commissioned in the reported period. Total operational RPP's under MoU with BRIT are 14.

### **II. Gamma Radiation Processing Services (GRPS)**

#### **(a) Radiation Sterilization Plant for Medical Products (ISOMED)**

- 5116 Cubic meters of healthcare products were processed using radiation for terminal sterilization at ISOMED, BRIT upto December 2015.
- Gamma Radiation Indicator Buttons were developed indigenously as an import substitute (Made in India) for qualitative indication of low and medium range gamma radiation dose delivery to the products.

#### **(b) Radiation Processing Plant (RPP), Vashi**

- About 2933 Tons of spices and other products like nutraceuticals and colour pigments were processed during the reported time period.
- NABL accreditation for dosimeter calibration laboratory of RPP, Vashi was obtained during this period.

### **III. Calibration Services for Portable Radiation Monitoring Instruments**

- BRIT is providing calibration services for gamma radiation survey instruments.
- The laboratory is approved by AERB in accordance with the Rule-29 of Atomic Energy Regulatory Board (AERB) Radiation Protection Rules, 2004.

### **IV. Isotope Application Services (IAS)**

- Isotope Application Services were provided to various industries such as BPCL, HPCL, IOCL etc. to trouble shoot catalyst cracking unit (CCU) by gamma scanning, leakage detections by radiotracer techniques etc. thereby saving crores of rupees.

- Shield integrity confirmation using radiotracer technique was also provided for APSARA nuclear reactor, BHAVINI nuclear reactor and for AREVA, U.S., a project by Larson & Toubro.
- Source loading pattern was designed for six Gamma Irradiators; dosimetry and radiation protection survey was performed for portable research irradiator and radiometry studies of shielding casks for NRB, DAE was undertaken during the reported period.

## V. Radioanalytical Laboratory (RAL) Services:

- Radioanalytical Laboratory carried out more than 3000 tests on export/domestic commodities and 900 tests on water samples for gross alpha, gross beta,  $^{226}\text{Ra}$ ,  $^{228}\text{Ra}$  and total uranium content.
- In addition to the above, one steel survey was conducted for certification of surface radiation dose and 27 food samples imported from Japan were also analyzed and certified.
- Setting up of additional Radioanalytical Laboratory at BRIT Project House, Deonar is completed during the reported time period.
- A similar facility is also provided at RCR, Bengaluru and a total of 71 samples (12 Nos. – Domestic and 59 Nos. – Export samples) were analyzed at this centre.

## VI. Electron Beam Processing Services (EBPS)

- The upgradation work of 2 MeV Electron Beam Accelerator (EBA) to 5MeV/15kW at BRIT, Vashi Complex has been completed during the reported period.
- BARC safety committee approved for initial trial operations @ 4.5MeV/9kW Beam power.
- During the reported period, products irradiated in the facility include fish, meat (for shelf-life extension), wheat powder for disinfection, polymer cable joint end-caps (for crosslinking and high temperature applications), waste water for hygeinization etc.

## VII. Services by RCR's and Quality Control Analysis of Radiopharmaceuticals for Outside Agencies

- Regional centres at Delhi, Bengaluru, Jonaki, Hyderabad, Dibrugarh & Kolkata, continued the supply of ready-to-use-radiopharmaceuticals to surrounding nuclear medicine hospitals. Around 3,000 consignments of in-vivo and in-vitro kits were supplied to RCR's for providing extended services to nearby Hospitals at these cities.
- Quality Control testing services was provided for kit efficacy and safety performance of cold kit for  $^{99\text{m}}\text{Tc}$ -labelled Myoview for M/S GE Healthcare.

## VIII. Customer Support Services Cell (CSSC) and Customer Relation Cell (CRC)

- As the nodal agency for sales and supply, marketing and customer relations, Co-ordination & logistics support were continued to be provided for the regular and uninterrupted supply of radioisotopes & allied products and radiation technology equipment to about 2000 user institutions in the healthcare, industrial, research and agricultural sector.
- During the reported period, an initiative of requesting the radiopharmaceutical users to send scanned copies of their SA-4 forms along with AERB NOC's to update their requirement and fasten up the process while being cost-effective for the users were highly appreciated. Also, the complaints received from the users were addressed to the satisfaction of the customers.

## C. Events, Awards and Implementation of Hindi Language at BRIT

- The first Training course on "Radiotracer and Related Techniques for Diagnostic Laboratories" was conducted in RPh BRIT from 28<sup>th</sup> April to 9<sup>th</sup> May 2015.
- IAEA Interregional Training Course on "Practical Aspects of the Production of Molybdenum by the Neutron-Gamma Reaction" was conducted for the first time at BRIT-BARC Vashi Complex from 22<sup>nd</sup> to 27<sup>th</sup> June 2015. The course was attended by international participants and also part of the faculty was from IAEA.
- One DAE Group Achievement Award and one individual award in the category of Scientific and Technical Excellence Award were awarded to BRIT scientists and technologists during the time period.
- Along with the scientific events at Board of Radiation & Isotope Technology, it has also held various activities towards implementation of Official Language.
- Also, scientists and engineers at BRIT were involved in various R&D and HRD activities along with their services towards production & supply of their respective products.

## D. Plan Projects

### 1. Project: DAE Medical Cyclotron Project: Radiopharmaceutical Facility

- **Progress:** Civil construction of Medical Cyclotron work is completed. Installation and commissioning is expected to commence soon after the physical inspection by the vendor and is expected to commence by June 2016.

### 2. Project: Indigenous HDR Brachytherapy Equipment (IHDR)

- **Progress:** Purchase Order for "Development of suitable TPS for IHDR-KARKNIDON" released. Two numbers of Ir-192 miniature source assemblies were made, but source holder

did not sustain the trials. Subsequently, new design of SS source holder was finalized in consultation with DRHR/BARC and given for manufacturing in CDM by DRHR.

### **3. Project: Setting up of Fission based <sup>99</sup>Mo Production Facility**

- **Progress:** The civil construction work of the buildings of <sup>99</sup>Mo Production facility is near to completion. Installation of ELAW tank, delay tanks, hoist and related piping are under progress.
- **The version-2 of 'Fire Hazard Analysis Safety Report' for <sup>99</sup>Mo Production Facility at ISOMED premises has been submitted to AERB.**

### **4. Advanced Facilities for Radiopharmaceuticals Production**

- **Progress:** (a) New Effluent Treatment plant of capacity 150CMD for BRIT, BARC-Vashi complex commissioned is operational. (b) Site clearance work for construction of new laboratory space at first floor over RPL extension building is in progress. (c) State of the art analytical equipments installed and commissioned during year - HPGe detector, Laser-Uranium analyser, dose calibrators, Mass spectrometer at RPL Vashi, and electrophoresis, real time PCR and Alpha-Beta counting system at JONAKI, Hyderabad. (d) As a part of project, New Pharmaceuticals services room, has been set up for preparing Water for injection, Sterile and pyrogen free glassware, equipment, glass vials etc. which are used in production and as important primary containers of all radiopharmaceutical products.

### **5. Project: Technology Development for Radiation Technology Equipment**

- **Progress:** Specifications for I-125 seed manufacturing plant have been finalized. Old canteen building of BRIT has been demolished and construction of new building has been started. Equipment such as X-ray based low dose irradiator, Co-60 camera, source changer have been developed.

## **BRIT Website:**

- BRIT website provided regular updates on various programmes and activities related to the developments in BRIT. Customer oriented reports were uploaded on website almost on daily basis enhancing coordination and communication with the customers.

## **Sales Turnover during 2015-2016:**

BRIT is expected to meet its turnover of Rs. 100 Crores during 2015-2016.