

Annual Report 2009 - 2010
Board of Radiation and Isotope Technology

Executive Summary

CH 4 Radiation Technologies & Applications

During 2009-2010, more than 52,000 consignments of various isotope products and round the clock radiation processing services were provided to customers across the length and breadth of the country as well as some located abroad bringing in a sales turnover of approximately Rs. 5000 lakhs.

Healthcare

16,000 consignments of ready to use radiopharmaceuticals of Iodine-131, Phosphorous-32, Chromium-51 and Samarium-153 were supplied to various Nuclear Medicine centers. Majority of these contained Iodine-131 radiopharmaceuticals, which amounted to about 550 Ci; 14200 consignments. 350 Ci of Mo-99 (TCM-2) was supplied for extraction of Tc-99m at hospitals. In addition to this various accessories of Tc-99m-Solvent extraction generator system and other products were supplied. About 54,000 Cold Kits for the formulation of Tc-99m radiopharmaceuticals (Code-TCK; 11 products) were supplied to various Nuclear Medicine centers. More than 550 Geltech generators were supplied in this period registering an overall growth of around 60% which is a commendable achievement.



The ongoing work of monoclonal antibody (ch TNT 1/B) labeling with Iodine-131, for M/s. Peregrine Pharmaceuticals Inc., USA is continuing and the contract has been further extended for 2010. About 6,500 kits of RIA and IRMA were supplied during the year to 300 immunoassay laboratories throughout the country.

BRIT's Clean Room Facility at Radiopharmaceuticals Laboratory

Nuclear & Biotechnological Tools

A user-friendly IRMA kit for Luteinizing hormone (LH) based on in-house produced magnetizable cellulose particles was developed. Commercial supplies of free T4 RIA kits produced using liquid handling system and an improved T3 RIA kits based on cost-effective liquid phase separation system were also launched. Custom synthesis of several ^{14}C , ^3H and ^{35}S labeled compounds was carried out successfully. The supply of enzyme, Taq DNA polymerase prepared at JONAKI, Hyderabad was continued through Labelled Compound Laboratory and sales showed a steady increase during the year.

Radio-analytical Laboratory analyzed nearly 2400 samples of various categories and about 250 water samples and has earned a revenue of about Rs.75 lakhs. Measurement of Cobalt-60 in steel samples for the steel manufacturers and exporters of the country is being regularly carried out in this laboratory and certified.

Nuclear Medicine: Cancer diagnostic & treatment services

15 teletherapy sources had been supplied upto December 2009 and one of these source was exported to Vietnam along with the Bhabhatron unit. 1 metre (500 mCi) ^{192}Ir -Pt wire was supplied to various hospitals and medical research centres for the treatment of cancer.

Radioisotope Sources



Sealed radiation sources for irradiators comprising of total activity of about 1000 kCi were fabricated, processed and supplied for use in various irradiators in the country. More than 1000 fresh Iridium radiography sources were fabricated and supplied with about 40 kCi of Ir-192 activity in the radiography cameras to various users.

TFS sources for Rocket Launcher

Tritium-filled light sources were supplied to BSF as per the MoU signed between BRIT and BSF. Development of TFS sources for Rocket launcher MKIII CGRL was undertaken.

Radiation Technology Equipment

BRIT supplied 48 nos. of radiography exposure devices upto December 2009. BRIT had launched an indigenous 20Ci ¹⁹²Ir portable radiography exposure device in addition to its 35 Ci capacity ROLI-1 radiography camera. 1 Blood Irradiator has been supplied to RCC, Thiruvananthapuram. Gamma Chamber (GC 5000) has been supplied to TINT, Bangkok & Warsaw, Poland. (8 other orders are in the pipeline).



Gamma Chamber (GC- 5000) for export to Poland

Gamma Radiation Processing Services

ISOMED offered prompt gamma sterilization services to its customers. About 5900 cubic meters of products were processed between April 2009 and December 2009 generating a revenue of Rs. 257 lakhs. By March 2010, the plant is expected to process more medical products yielding a total revenue of Rs.330 lakhs. ISO 9001-2000 certification was also obtained for this plant.

Radiation Processing Plant, Vashi processed about 1600 MT of spices and other products for its 125 customers in the country (figures till November 2009 show an 86.5 % increase). Rs. 98.5 lakhs of revenue that was generated is also up by 89% over the last year. Plant is expected to process a total of 2400 MT of material this year generating Rs.150 lakhs in revenue. ISO 9001-2000 certification was also obtained for this plant.



A tripartite agreement has been signed with Maharashtra State Agricultural Marketing Board and BARC for service operation of KRUSHAK from this year by MSAMB for 3 years.



New Radiation Processing Plants in Private Sector

M/s. Jhunsons Chemicals Pvt. Ltd. have completed the construction of the Radiation Processing Plant and trial run is commenced. It

PANBIT Report being handed over to Dr. Md. Mosharraf Hossain, Chairman, Bangladesh Atomic Energy Commission, by CE, BRIT & , Mr. S. Bhattacharya, DANVER Hydromatics P. Ltd., Kolkata. Dr. Rehana, Begum, Director, IFRB, Bangladesh, at extreme right.

would become the eighth such plant in private sector in the country. The contract received from the Atomic Energy Research Establishment, Bangladesh has been executed and BRIT has supplied Co-60 source for its PANBIT irradiator alongwith dosimetry and supervision of the entire work of refurbishment.

Isotope Application Services



Introducing the radiotracer in the tank of IOCL.

BRIT provided isotope application services to Indian Oil Corporation Ltd. (IOCL) and HPCL for leakage detection of underground pipeline & gamma scanning of process columns respectively.

Customer Support Services Cell

Customer Relationship Cell (CRC) continued serving BRIT customers providing them help on matters related to regulatory authorities and on procurement and use of radioisotope products and equipment. The transportation of about 52,000 consignments of radioisotope and allied products, majority of them by air, was carried out in a safe and a reliable manner. Major transportation involved movement of kilocurie amounts of radioactive sources from RAPPCOF, Kota to Mumbai, Mumbai to Bhiwadi, Bengaluru, Vadodara, Delhi and Bangladesh; and teletherapy sources from Mumbai to various cancer hospitals in the country and Gamma Chamber and Blood Irradiator units to various research centres and hospitals.

BRIT website provided updates on products and various activities of BRIT. Website continued to provide prompt information on the airway bill numbers for the despatched products and a regular update on the status of radiography cameras besides the important customer oriented messages. The retail outlet at Mumbai for supply of cold kits that was set up for the benefit of nuclear medicine user institutions in and around Mumbai continued serving customers. There are now three more retail outlets for radiopharmaceuticals at RCR, Hyderabad, RCR, Bangalore and RCR, Delhi. SMS based query software for better BRIT-customer interface has also been implemented.

Radioisotopes and allied products supplied by BRIT

Sr.No	Item	Actual between April-December, 2009	Expected to be achieved April,2009 – March, 2010
1	Consignments	43000	≈ 52000
2	Co-60 Activity	800 kilo curies	≈ 1100 kilo curies
3	Sale Value	Rs. 3714 lakhs	Rs. 5000 lakhs

Plan Projects

All the major equipment and machinery for the Hot Cell Laboratories at Medical Cyclotron Facility at Kolkata has been received. The installation and commissioning will commence soon after the availability of building construction of which is undertaken by VECC. Substantial progress has been received in all other projects being undertaken by BRIT. An additional project has been proposed for setting up of a Fission Moly Production Facility to be constructed in the XI and XII Plan Periods.

Annual Report 2009 - 2010
Board of Radiation and Isotope Technology

Descriptive Part

CH 4 Radiation Technologies & Applications

Board of Radiation & Isotope Technology (BRIT) continued its mandate towards progress by regular production and supply of a vast array of high quality radioisotope products which include sealed radiation sources of activity ranging from few microcuries to millions of curies mainly for medical and industrial use; radiation technology equipment such as gamma radiography camera, gamma chamber units, Blood irradiators; radiopharmaceuticals, immunoassay kits, radiochemicals, labeled compounds, labeled biomolecules, ^{99m}Tc generators, 'cold' kits, oligo nucleotides, self-luminous compounds, etc. As a service provider, BRIT also operates plants for radiation sterilization of medical products (ISOMED) at Trombay; Radiation Processing Plant at BRIT Vashi Complex for radiation processing of spices and allied products, and runs Co-60 handling facility (RAPPCOF) at RAPS, Kota, JONAKI Laboratory at Hyderabad and has other Regional Centres located at Bangalore, Delhi, Kolkata and Dibrugarh. BRIT runs a Radio-analytical Laboratory at Vashi for detection of radioactivity in products for the benefit of various exporters and importers.

The various activities carried out by BRIT related to the production and supply of radioisotopes and allied products and radiation technology equipment for use in Healthcare, Industry, Agriculture and Research during the period of this report are as follows:

4.5 Healthcare

4.5.1. Radiopharmaceuticals

16000 Consignments of ready to use radiopharmaceuticals of ^{131}I , ^{32}P , ^{51}Cr and ^{153}Sm were supplied to various Nuclear Medicine Centers. Majority of these contained ^{131}I radiopharmaceuticals, which amounted to about 550 Ci ;14200 consignments. The use of following injectables ^{153}Sm -EDTMP and ^{32}P as sodium orthophosphate has been increased to various nuclear medicine centers in India 350 Ci of ^{99}Mo (TCM-2) was supplied for extraction of ^{99m}Tc at hospitals. In addition to this various accessories of ^{99m}Tc solvent extraction generator system and other products were supplied. About 54,000 cold kits for formulation of ^{99m}Tc radiopharmaceuticals (code-TCK: 11 Products) were supplied to various Nuclear Medicine Centers.



The ongoing contract work, of monoclonal antibody (ch TNT 1/B) labelling with ^{131}I , for M/s Peregrine Pharmaceuticals Inc., USA, has continued in 2009 and M/s Peregrine has further extended the contract for 2010.

Under the XIth plan, a new project for the production of $^{99}\text{Mo}/^{99m}\text{Tc}$ Column generator

BRIT's Clean Room Facility at Radiopharmaceuticals Laboratory

using high specific activity ^{99}Mo is being carried out. The work is in progress and the fabrication of facility is near completion at the works of supplier German Company.

Two new products a) Kit for the preparation of $^{99\text{m}}\text{Tc(III)-DMSA}$ injection (Code: TCK-33), for renal imaging, and b) Single component Kit for the preparation of $^{99\text{m}}\text{Tc-MIBI}$ injection (code:TCK-50 A), for myocardial perfusion imaging, have been developed. Radiopharmaceutical Committee (RPC) has granted approvals for regular production and supply of these products. These will be introduced in the production and supply soon.

The shelf life for kit for the preparation of $^{99\text{m}}\text{Tc-MDP}$ injection (Code :TCK-30), a skeletal imaging agent, has been enhanced from 4 months to 10 months and has been approved by RPC.

DAE Group achievement award, was bagged by team for “Development of Colloidal Samarium Phosphate ^{32}P injection”, a new radiopharmaceutical radio-synovectomy.

$^{99\text{m}}\text{Tc}$ Column Generator Production Facility (TcGPF)

In the third year since commencement of supply of Tc-99m Geltech generators to Nuclear Medicine Centres, the Technetium Column Generator Production Facility has been operational. An uninterrupted supply of generators as per schedule was maintained throughout the year despite uncertainties/disruptions in the availability of imported fission produced Mo-99. For a period of five months of the year, the generator supply was sustained using indigenous reactor produced Mo-99 alone. Weekly supply was introduced since April 2009 against the existing fortnightly supply to cope with increased market demands.

547 generators were supplied in this period registering an overall growth of around 60% which is a commendable achievement.

4.5.2 Nuclear Medicine : Diagnostic & Treatment Service

About 6500 kits of radioimmunoassay (RIA) and immunoradiometric assay (IRMA) were produced and supplied to over 300 immunoassay laboratories throughout the country till November 2009 (projection April 2009 – March 2010: 9800 kits).

The development of user-friendly IRMA kit for Luteinizing hormone (LH) based on in-house produced magnetizable cellulose particles was completed. The developed product has been approved by the Radiopharmaceutical Committee (RPC) for regular production and supply.

User-friendly kit formulation makes use of in-house produced magnetizable cellulose particles along with ready-to-use serum based standards to cover diagnostically useful range. The assay system consists of only three pipetting steps with a convenient incubation time at ambient temperature.

Commercial supplies of free T4 RIA kits produced using liquid handling system was made effective after rigorously evaluating indigenously fabricated high throughput automatic liquid handling system capable of handling all the steps required for the large scale production of antibody coated tubes. Now the kits are being produced in a well-equipped laboratory specifically designed for this purpose.

Improved T3 RIA kits based on cost-effective liquid phase separation system were launched. Modified and improved assay procedure makes use of uniform standard and sample volumes and with simplified data processing for the convenience of the analysts.

The Regional Centres located at Bangalore and Delhi processed ready-to-use ^{99m}Tc radiopharmaceuticals for use in the host medical centres apart from supplying the products to other hospitals in the region. RCR, Bangalore carried out 4400 RIA investigations and supplied 68,200 mCi of ready-to-use ^{99m}Tc formulations. RCR, Delhi produced 45000 mCi of ready-to-use ^{99m}Tc radiopharmaceuticals for nuclear medicine institutes and hospitals in the Delhi region. Research and Development studies were further pursued on development of new Prototype column based alternate ^{99m}Tc Generator based on utilization of SPE method developed by BRIT which is compatible with indigenous reactor produced low/medium specific activity ^{99}Mo molybdate. Development and evaluation of prototype ^{99m}Tc generator is in progress. Retail outlet for supply of cold kits for preparation of various ^{99m}Tc radiopharmaceuticals was utilized by Nuclear Medicine Hospitals in Delhi. Around 700 kits valued at Rs. 15.65 lakhs were supplied.

At the Regional Centre, Kolkata, significant progress has been made in the DAE Medical Cyclotron Project.

- FAT acceptance tests of hot-cells and associated systems have been successfully completed at the factory of M/s COMECER, Italy
- All the shipment (containing various cyclotron systems and radioisotope production equipment) from M/s IBA, Belgium and M/s COMECER have been received.

Standardization of pulse electroplating of metal using square wave pulse was carried out. In order to develop pulse electroplating techniques for few metals, a project entitled "Development of pulse electroplated target for high current irradiation in cyclotron" funded by BRNS has been started in collaboration with the Central Electrochemical Research Institute, Karaikudi, Tamil Nadu.

Nickel has been successfully electroplated earlier on a copper substrate using square wave pulse and platinum anode. Presently standardization of pulse electroplating of Cd and Co are going on and this work would be completed in couple of months. These electroplated targets would be useful for irradiation in cyclotron for radioisotope production.

Pulse electroplating of Cu has been carried out successfully. An electromechanical bath has been designed and fabricated at VECC to carry out this work. Development of separation of (a) Cu and Ni and (b) Cu and Zn using ion-exchange chromatography was carried out. Progress was made in the development of a novel $^{99}\text{Mo}/^{99m}\text{Tc}$ generator using Alumina column and MEK. Separation of ^{131}I using solvent extraction method was carried out.

Regional Center, Dibrugarh provided RIA & IRMA diagnostic services for the needy patients of the entire North-Eastern region. More than ten thousand patients of the region avail the services from this center. Apart from medical colleges, patients also come from the nearby tea garden hospitals, civil hospitals etc., For the ICMR national project on Hypertension & Salt intake, 600 assays of serum, Aldosterone and Renin activity was carried out.

4.3.2 Nuclear & Biotechnological Tools

4.3.2.1 Labeled Compounds

Labeled Compounds Programme of BRIT is involved in the synthesis and supply of a variety of ^{14}C , ^3H and ^{35}S -labelled products, oligonucleotides (DNA primers) and ready-to-use non-radioactive (cold) kits. Cold kits are essentially used for labelling of DNA and RNA to make ^{32}P -radiolabelled probes. All these products are powerful and versatile tools and are used as radiotracers in diverse investigations in the fields of biology, agriculture, medicine and chemistry.

Labeled Compounds Programme is also involved in the production and supply of tritium filled sources of various types for defence applications. These sources are used for the illumination of various types of military gadgets and instruments. Custom-synthesis of a few compounds was also carried out to meet the specific requirements from a few researchers.

The development of appropriate methods for the preparation of deuterated compounds and especially deuterated NMR solvents as part of the MoU signed by BRIT with Heavy Water Board is also being pursued.

Highlights

1. Custom synthesis of four ^3H -labelled compounds, namely Juglone-T(G), Vitamin D3 (T(G), 2-deoxy Glucose T(G) and MK 886 were carried out successfully.
2. As part of the contract manufacturing job with M/s. Peregrine, USA, the quality control assay of four batches of ^{131}I -labelled antibody was carried out with respect to its ion contents
3. Tritium-filled light sources were supplied to BSF as per the MoU signed between BRIT and BSF.



4. Development of TFS sources for Rocket launcher MKIII CGRL was carried out.
5. Supply of enzyme, Taq DNA Polymerase, prepared at Jonaki laboratories, Hyderabad, was continued through LCL.

TFS source for Rocket Launcher

4.3.2.2 JONAKI Laboratory at CCMB Campus, Hyderabad

JONAKI, the Labeled Biomolecules Laboratory of BRIT at CCMB campus is primarily involved in the production of ^{32}P labeled nucleotides required for molecular biology, biotechnology, biomedical and drug discovery research. It also markets ^{35}S labeled amino acids produced at labeled compounds laboratory at BRIT, Mumbai. Further, this laboratory produces and supplies many nucleic acid purification kits, polymerase chain reaction kits and Taq DNA polymerase. This laboratory meets the requirements of about 100 research institutes and universities and many industrial research centers. In addition, this laboratory provides services to the Nuclear Medicine Centers around Andhra Pradesh by locally providing nuclear imaging cold kits produced at the radiopharmaceuticals laboratory of BRIT at Mumbai. A turnover of Rs. 1.38 crore has been achieved till November 2009 and a turnover of Rs. 1.5 crore is expected this year.

JONAKI has entered the field of molecular diagnostics last year by introducing an agarose gel based PCR detection kit for the detection of M. Tuberculosis in collaboration with LNMS, RMC, BARC. An improved multiplex PCR based M. Tuberculosis detection kit has been sent for customer evaluation. A real time PCR machine has been installed recently which will enable real time PCR applications.

4.3.2.3 Radioanalytical Laboratory , BRIT /Vashi Complex, Navi Mumbai

The laboratory has been rendering analytical service by measuring the residual radioactivity levels in food as well as non-food samples categorized as Meat products, Farm products, Dairy products and Miscellaneous products, and issues 'Radioactivity Test Certificates' to exporters which forms an important export document.

BRIT's measurements are guided by the levels of different Radionuclides such as ^{134}Cs , ^{137}Cs , ^{131}I , etc., as prescribed by the Atomic Energy Regulatory Board (AERB) of India. The other radioisotopes such as Ra-226, Ra-228 are determined in water samples.

To accommodate various non-food samples, the Food Analysis Laboratory has been re-christened as Radio Analytical Laboratory (RAL) with effect from May 2009 and measurement of Cobalt-60 in steel samples which is causing concern to the steel manufacturers and exporters of the country, is being regularly carried out in this laboratory and certified.

During the year under report, RAL has analysed nearly 2400 samples of various categories and about 250 water samples and has earned a revenue of about Rs. 75 lakhs.

Quality Control Program

Quality control testing and analysis was carried out on all ready-to-use radiopharmaceuticals, generator based products, RIA/IRMA kits, inactive raw materials and active raw materials. Up-gradation of the facilities was constantly done by installation of the latest state-of-the-art equipment wherever possible and also by preparing up-to-date monographs for all products being tested.

4.5.3. Nuclear Medicine: Cancer diagnostic & treatment services

15 teletherapy sources with 151 kCi(2511 RMM) of Co-60 activity were supplied to various hospitals for the treatment of cancer. Out of them one source was exported to Vietnam along with the Bhabhatron unit.

Two numbers of Cs-137 kits with 1600 mCi were supplied to hospitals for brachytherapy. Two Csk-1 kits without the source were supplied to hospitals.

Industrial Applications

4.7.1. Radioisotope Sources.

During the April-Dec 2009 period sealed radiation sources group has produced/loaded/ supplied sources for the following irradiators :

100 kCi for Jhunsons Ltd., Bhiwadi, Rajasthan
134 kCi for Microtrol, Bangalore
200 kCi for Universal Medicap Ltd, Vadodara
100 kCi for Sriram Institute, Delhi
57 kCi for IFRT, PANBIT, Bangladesh

BRIT has further plans to load sources in the following irradiators during Jan- Mar, 2010

100 kCi for Krushak, Lasalgoan
200 kCi for Agrosurg, Vasai
100 kCi for Innova, Bangalore
60 kCi for Rahuri Irradiator
100 kCi for Vietnam

Cobalt-60 for one blood irradiator – 743 Ci and Cobalt-60 with a total activity of 41 kCi for four Gamma Chambers were supplied. More than 1000 fresh Iridium radiography sources will be fabricated and supplied with 40000 Ci of Ir-192 activity in the radiography cameras to various users. 60 decayed sources were removed in the hot cells . 10 sources for Co-60 radiography cameras with 450 Ci of activity were supplied. One meter of Ir+Pt wire was supplied with 500 mCi activity.

Three consignments of Sc-46 with 8 Ci each were supplied for various ports for sediment transportation studies. Around 10,000 consignments of various isotopes were packed and dispatched to various users in industry and medicine during this period.

4.7.2. Gamma Radiation Processing Services (GRPS)

4.7.2.1. Radiation Sterilization Plant for Medical Products (ISOMED)

ISOMED continued to offer prompt and efficient gamma sterilization services to large number of customers spread all over the country. More than 5000 cubic meters of different types of products were processed between April 2009 and December 2009 generating a revenue of Rs. 257 lakhs. By March 2010, the plant is expected to process more medical products and likely to yield a total revenue to the tune of Rs. 3.3 crores.

The facility continued to operate, in conformance with all the requisite regulatory requirements with an average Plant Load Availability Factor of above 99% and average Plant Utilisation Factor of 85%. The ISOMED facility acquired ISO 9001: 2000 Quality Management System accreditation in September 2009. Efforts are in full swing to acquire the ISO 22000:2005 – Food Safety Management System for the facility. It is expected to get this accreditation well before end of this fiscal year.



ISOMED was audited by Medicine and Healthcare Products Regulatory Agency (MHRA) U.K for the EU GMP compliance certification. Audits in respect of Supplier Quality Management System, Quality Management System surveillance pertaining to various customers of the facility were also conducted. Some established companies have newly registered as ISOMED customers for availing radiation sterilization of their products.

4.7.2.2. Radiation Processing Plant, Vashi (RPP, Vashi)

Radiation Processing Plant, Vashi is providing gamma radiation processing services for spices, ayurvedic raw material and pet feed etc. to more than 130 customers from all over the country. During the current financial year, about 1600 MT of spices and other products were processed till November 2009 which is 86.5% increase in quantity over the corresponding period last year (857 MT). Revenue generation till November 2009 is about Rs.98.5 lakhs which is about 89% more than the revenue generated in corresponding period last year



This year the plant is expected to process around 2400 MT spices and allied products yielding revenue of about Rs.150 lakhs. Since its inception, this facility has processed about 13,000 tonnes of products realizing revenue of about Rs. 700 lakhs. Source replenishment was carried out in December, 2009 and source strength was enhanced from 255 kCi to 454 kCi. to cope up with the increased demand for radiation processing.

The facility has been accredited with ISO-9001:2000 (Quality Management Systems) during the current year and BRIT are in advanced stage of getting ISO-22000:2005 (Food Safety Management Systems) accreditation.

4.7.2.3 KRUSHAK Irradiation Facility (Lasalgaon, Nashik)

A tripartite agreement has been signed with Maharashtra State Agricultural Marketing Board and BARC for service operation of KRUSHAK from this year by MSAMB for 3

years. Approx. 130 tonnes mangoes were processed and exported to US by various exporters.

The facility is being upgraded for multi-tasking by BARC i.e. to convert it into a multi product processing unit covering wide range of food products requiring low dose to medium dose exposure. This work is scheduled to be completed in January 2010. Cold rooms have been provided at loading and unloading areas for transit storage of mangoes.

4.7.2.4 New Radiation Processing Plants in Private Sector

The construction of radiation processing plant of M/s.Jhunsons Chemicals Pvt.Ltd. has been completed and commissioning dosimetry jobs have been completed. The source loading is expected to commence commercial operations soon.

4.7.2.5 Refurbishment of AERE Bangladesh's Irradiator.

A contract was received from Institute of Food & Radiation Biology, AERE, Bangladesh, for refurbishment and loading of Co-60 pencils. The PANBIT flask was brought to Mumbai & source was replenished. All other services such as dosimetry etc. were completed and plant was handed over back to AERE.



PANBIT report being handed over to Dr. Md. Mosharraf Hossain, Chairman, Bangladesh Atomic Energy Commission(BAEC) by CE, BRIT & Mr. S. Bhattacharya, DANVER Hydromatics P. Ltd., Kolkata. Dr. Rehana Begum, Director, IFRB, Bangladesh, at extreme right.

4.7.2.6 EB Processing

EB processing of polymer materials and precious stones continued using ILU-6 EB accelerator. EB processing services were extended to irradiate 13,000 carat of diamonds, 7 lakh pieces of industrial polymer materials and for various BRNS research projects accumulating around ~Rs.15 lakh in revenue.

To ensure the safety of the industrial material during continuous processing, a special 'Material over-exposure prevention unit' has been designed, fabricated, tested and incorporated in the facility conveyor system which can automatically sense and track the movement of product trays and shut down the beam in case of any malfunction.

4.7.3. Radiation Technology Equipment

4.7.3.1. Gamma Chamber GC 5000:



During the current financial year, Gamma Chamber GC 5000 has been supplied to TINT Bangkok & Warsaw-Poland.

Gamma Chamber (GC- 5000) for export to Poland.

Following more orders are expected to be executed in the coming months :

1. Jadavpur University, Kolkata
2. RSD, BARC, Trombay, Mumbai
3. ACD, Behrampur
4. IAEA order for Romania
5. ISRO, Bangalore
6. IGCAR, Kalpakam
7. NEHU, Shillong

4.7.3.2. Radiography Camera ROLI-1 & III

BRIT supplied 48 nos. of radiography exposure devices up December 2009. It is expected to sell another 25 cameras by March 2010.

341 ROLI cameras were serviced during the year and another 100 cameras will be serviced before March 2010. 725 decayed sources were removed between April-December, 2009. Another 200 sources will be disposed off by March 2010. 600 imported cameras were inspected by December 2009. By March 2010, another 200 imported cameras will be inspected.

Portable Radiography Exposure Device ROLI-III launched

BRIT had launched a $20\text{Ci }^{192}\text{Ir}$ portable radiography exposure device which was developed indigenously. This will compliment 35 Ci mobile device already being manufactured and supplied by BRIT.

4.7.3.3. Blood Irradiator

The programme of production and supply of Blood Irradiator BI 2000 has been pursued further. One Blood Irradiator has been supplied to RCC, Thiruvananthapuram

Orders have been received from :

- Pearless Hospital, Kolkata
- Pratibha Hospital, Ahmedabad
- NEHU Shillong

4.7.3.4. Install & Operate Irradiator

The civil work for the irradiator is completed. EOT crane has been installed. The fabrication of components is completed. The control system is also ready.

4.7.3.5. QA of Sealed Sources, Radiometry Scanning and Irradiation Services

ROLI 1 cameras were tested at the REPF workshop and the Radiological lab of BARC. Density measurements were carried out on cobalt-59 pellets and slugs and also chemical analysis and XRF analysis were carried out for the acceptance of the material for irradiation.

All the sealed sources were subjected to the various quality control checks before release.

4.7.3.6. Isotope Application Services

Identification of leak location in underground JVPL pipeline

An underground pipeline, 26 km long and 10" diameter, belonging to Indian Oil Corporation Ltd. (IOCL) was suspected to be leaking as drop in pressure was observed in the pipeline. Conventional techniques could not provide the location of leak. Hence QA & IAS, BRIT was requested to help in locating the leak from this pipeline.



Introducing the radiotracer in the tank of IOCL.

1 Ci Br-82 diluted in 1000 kilolitres of water as ammonium bromide was used as a radiotracer. A detector data logger was used to record the leaked out radioactivity and marker sources. The exact location of the leak was identified with respect to the location of the markers. After repairing the leak, hydro-test of

the entire pipeline was carried out. It was observed that the pipeline is now holding the pressure indicating that the pipeline had no additional leak.

Gamma Scanning of Industrial Process Column at HPCL, Mumbai

Gamma Scanning provides a non-destructive and cost-effective way of analyzing problems of process columns. Scan data is useful for scheduling shutdowns, estimating turnarounds, carrying out periodic maintenance and process optimization.



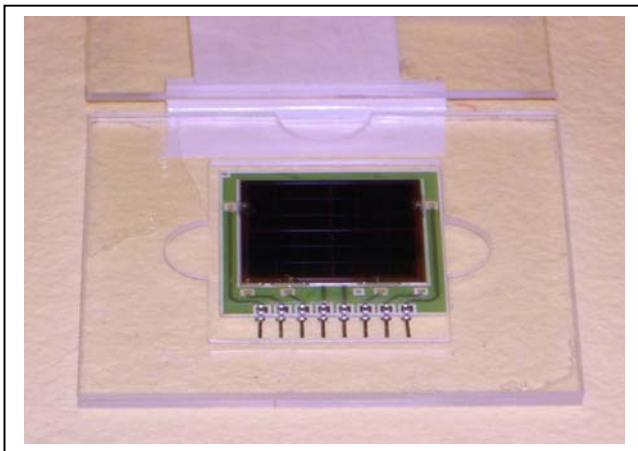
One of the columns in Hindustan petroleum Corporation Limited (HPCL), Mumbai was misbehaving. To identify the cause of reduction in the production of aviation turbo fuel obtained from the top portion of the column, HPCL requested QA & IAS, BRIT to carry out the column scanning. Since the column had double pass trays, it was scanned in two chords with collimated 100 mCi Co-60 source and a collimated NaI scintillation detector using automated gamma scanning system. Trays with severe flooding were identified. The results were confirmed by opening the column during shutdown.

A two day workshop on 'Column Scanning & Pipe Scanning' was organized at M/s Reliance Industries Ltd., Patalganga, in collaboration NAARRI, during Nov 9-10, 2009.



4.7.3.7 Silicon Pad Detectors exported to GANIL, France

Silicon Pad detectors find application in Measurement of Position and Energy of Charged Particles in Nuclear Physics.



Many silicon detectors are required to carry out an experiment approved by Physics Advisory Committee (PAC) of Institute of Modern Physics (IMP) of Lanzhou, China in collaboration with M/S GANIL, FRANCE. BRIT had made these detectors in collaboration with Electronics Division, BARC and BEL and supplied to them well within the specified period.

4.14. Supporting Services

4.14.1. Customer Support Services Cell

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 year 2009-10, Customer Relationship Cell (CRC) continued serving customers and made it more convenient to customers to interact with the officials of BRIT and regulatory authorities in matters relating to procurement and use of radioisotope products and equipment. The retail outlet for supply of cold kits set up for the benefit of nuclear medicine user institutions in and around Mumbai continued serving customers bringing in a revenue of approximately Rs. 14 lakhs.

The transportation of about 52,000 consignments of radioisotope and allied products, majority of them by air, was carried out in a safe manner. Major transportation activities carried out during the year includes movement of kilocurie amounts of radioactive sources from RAPPCOF, Kota to Mumbai, Mumbai to Bhiwadi, Bangalore, Vadodara, Delhi and Bangladesh; and teletherapy sources from Mumbai to various cancer hospitals in the country and Gamma Chamber and Blood Irradiator units to various research centres and hospitals.

BRIT website provided updates on products, services and various activities of BRIT. The website continued to provide prompt information on the airway bill numbers for the despatched products and a regular update on the status of radiography cameras besides the important customer oriented messages. Website is updated on a daily basis and includes ordering forms for the customers besides information on scientific aspects.

BRIT has installed a new SMS-based query software to facilitate customers in order to enable tracking information pertaining to orders at different levels of processing.

Radioisotopes and allied products supplied by BRIT

Sr.No	Item	Actual between April-December, 2009	Expected to be achieved April,2009 – March, 2010
1	Consignments	43000	≈ 52000
2	Activity	800 kilo curies	≈ 1100 kilo curies
3	Sale Value	Rs. 3714 lakhs	Rs. 5000 lakhs

4.14.2. Engineering Support Services Unit (ESSU)

Engineering Support Services Unit (ESSU) provided the vital infrastructural and utility services to BRIT and BARC facilities at Vashi Complex. Provision of uninterrupted electrical power, air conditioning and ventilation services on continuous basis to the radioactive laboratories, civil and public health services and communication services in Vashi Complex are the major challenges faced. Quality service provided by the ESSU have enabled the production units to meet the production and supply schedules as planned. The horticultural & pest control system that has been set up enables to keep the Complex green and environment friendly.

Status of the Plan Projects

X Plan Projects

BRIT has taken up several projects for execution under the plan project scheme. All these projects have been aimed to enhance its capacity for the development of new products, improvement in quality and also development of infrastructural facilities. Under the Xth plan, three major projects were initiated for execution. These are:

- Integrated Facility for Radiation Technology (IFRT)
- Revamping and Augmentation of Infrastructural Facility (RAIF)
- DAE Medical Cyclotron at Kolkata

1. Project: Integrated Facility for Radiation Technology (IFRT)

Objective of the project is to set up a Hot Cell at BRIT Vashi Complex for handling, storage and fabrication of sealed sources up 300 kCi of Co-60. The financial outlay of the project is Rs.1519 lakh.

This project is in advance stage of execution as civil construction for administrative building, water pool, Radiometry room and Hot Cell has been completed. Project is expected to be completed soon.

2. Project: Revamping & Augmentation of Infrastructural Facilities (RAIF)

The project is proposed for Revamping and Augmentation of Infrastructural Facilities of BRIT at Vashi to enhance infrastructural support for production facility. The major activities of the project are to procure instruments and equipment for revamping and augmenting production, quality and safety of operations and personnel. Financial outlay of the project is Rs.1592 lakhs and completion date is March 2010.

Civil construction for install and operate irradiator is completed and clean room facility has been commissioned. Apart from this procurement of equipment is in progress and Automated Column Scanning System has been procured and also order for mobile hot cell has been placed.

3. Project:: DAE Medical Cyclotron Project: Pharmaceuticals Facility

A medical cyclotron facility is being installed at VECC, DAE, Kolkata for the production of PET and SPECT radioisotopes to be used for diagnostic and therapeutic purposes. Major equipment including hot cells have been procured. All the major equipment & machinery for the Hot Cell laboratories have been received. The installation and commissioning will commence soon after the availability of building construction for which is undertaken by VECC.

XI Plan Projects

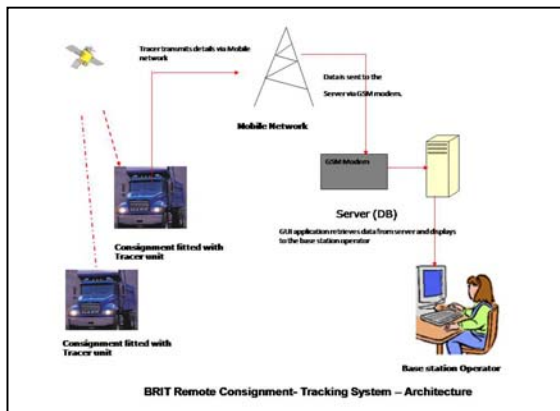
Apart from the Xth plan project there are 5 more projects which are proposed for execution under XI plan. These projects are aimed towards development of new products, improvement in quality of existing products and improvement in manufacturing processes. Financial sanction for four of these projects has been received except for the project, Construction of State-of-the Art Immunoassay Facility. Brief description of the XI plan projects are given below:

1. Project : Integrator Irradiator Development Project

Estimated Cost : Rs. 300 lakhs

Objectives

To upgrade safety and security features in the RPP, Vashi and ISOMED facilities and to set up an Irradiator Training Facility for training of personnel for operation of irradiator.



Progress: Following work has been carried out:

- Access control system installed at Vashi
- System for vehicle tracking system has been installed
- Early fire warning system for ISOMED is procured
- Aerosol generator has been designed and fabricated

2. Project: Production Facility for $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$ Column Generators of High Specific Activity Mo-99.

Estimated Cost: Rs. 750 lakhs

Objectives

Setting up of a new automated facility for production of Mo-99 Tc-99m Column Generators using high specific activity Mo-99.

Progress: Tendering process completed for supply of production facility of Mo-99 Tc-99m Column Generators using high specific activity Mo-99, for the Hospitals and order is placed. Drawing for facility has been prepared and approved.

3. Project: Construction of State-of-the-Art Immunoassay Facility

Estimated Cost: Rs. 205 lakhs

Objectives

- a) Development of building up of infrastructure for coated tube technology and state-of-the-art Laboratory with GMP/GLP compliance with a special focus on contract manufacturing
- b) Development and building up of infrastructure for immunoassay based on non-isotopic labels.
- c) Development of diagnostic kits for infectious diseases.

Progress: Procurement of following equipments needed for development of isotopic/non-isotopic assays has completed:

- Spectrophotometer
- Dehumidifier
- Multi-well RIA Counter
- Laboratory has been refurbished partly

4. Project: Construction of State-of-the-Art GLP and GMP

Estimated Cost: Rs. 340 lakhs

Objectives

Upgradation of the laboratory for GLP and GMP compliance by following:

- a) Removal of the existing corroded 20 years old fume hoods, cut and disposal through WMD
- b) Installation of new fume hoods
- c) Wear resistant laboratory flooring of Laboratory
- d) Furnish the lab and facelift office for aesthetic look
- e) Introduce the state-of-the-art synthesis facility, enhance the analytical evaluation, quality control of the labeled compounds. Introduction of microwave synthesis and introduction of instrumental analysis.
- f) Augmentation of oligo-nucleotides synthesis facility
- g) Setting up of state-of-the-art lab for C-14 urea capsule production and
- h) Setting up of low background counting lab food analysis.

Progress: Following work has been carried out

- Decontamination of working tables and fume hoods in two laboratories completed
- Order placed for procurement of stainless steel fumehoods (12 Nos.), new working tables, flooring, paneling etc.
- HPLC instrument procured
- UV spectrophotometer and Portable liquid scintillation procured.

5. Project: Indigenous HDR Brachytherapy Equipment (IHDR)

Estimated cost: Rs. 800 lakhs

Objectives:

- a) Establishing the complete process and facilities for fabrication of Ir-192 HDR
- b) sources for regular production.
- c) Development of indigenous, remote operated high dose rate (HDR) brachytherapy equipment including necessary treatment.



Progress:

Purchase order for “Design, development, of IHDR and desired software capable of communicating with all common treatment planning software. Qty-12 sets” has been released. Prototype equipment is developed for testing.

An additional project has been proposed for setting up of Fission Moly Production Facility to be constructed during XIth & XIIth Plan periods.
