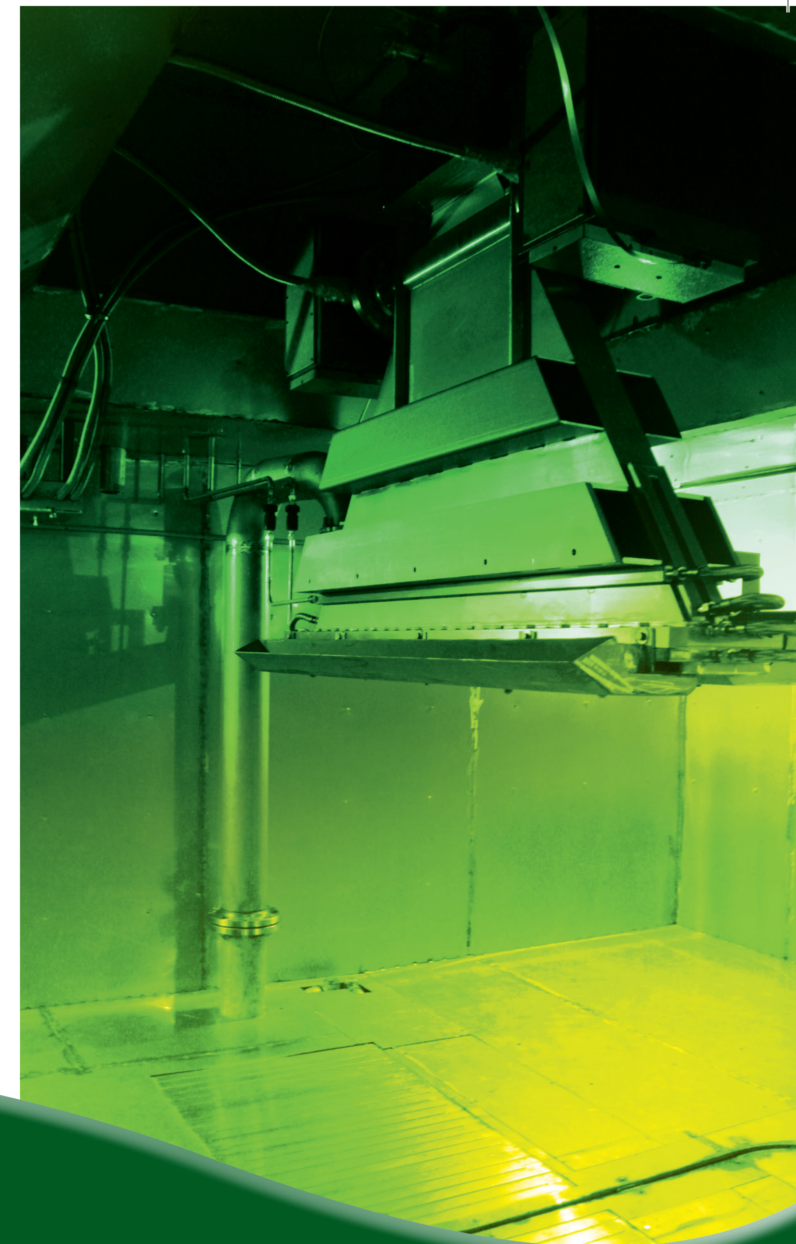
Action

- *International Linkages and Government Support*

PNRI engaged in a Technical Cooperation Project with the International Atomic Agency in 2009 for the establishment of an E-beam facility at PNRI. With funding from the Department of Science and Technology Grants-in-Aid, as well as additional financial assistance from the Japanese and US governments, the project was implemented in 2012. EB Tech of South Korea supplied the electron beam accelerator.

Construction of the Electron Beam Facility

The construction of the EB building and the installation and commissioning of the EB accelerator and its auxiliary equipment were already completed. It was recently inaugurated on December 2014 during the 42nd Atomic Energy Week. The Electron Beam Facility is now operational and test runs are currently being conducted in the facility.



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Electron Beam Irradiation Facility for Research and Industrial Applications

Problem

Over the past 30 years, both developed and developing countries all over the world have established around a thousand electron beam accelerators dedicated to commercial and industrial purposes. Meanwhile, except for two private companies intended for in-house use, the Philippines has no electron beam facility for contract or service irradiation.

PNRI's present Cobalt-60 Multipurpose Irradiation Facility, which operates on a semi-commercial scale, has demonstrated many of the applications of radiation processing using gamma-rays and has been regularly serving clients from the food, cosmetics, packaging, medical products and pharmaceutical industries.

As the next step in PNRI's use of irradiation technologies, the 2.5 MeV electron beam facility will be the first of its kind in the country intended for full-scale research and development and semi-commercial E-beam services, opening new applications in various industries.

Outcomes

- *Better Quality of Industrial and Commercial Materials*

Electron beams can be used to improve the quality of wires and cable insulation, tires, automobile parts, plastics, fibers and semiconductors. It may also increase the toughness of much lighter materials such as carbon fiber or reinforced plastic.

- *Synthesis of High Technology Products and Experimental Samples*

E-beams can be used to synthesize hydrogels, including nanogels and microgels used for medical purposes such as PNRI's Skin-up® hydrogel dressing for wounds and burns. Among other experimental applications would be for developing adsorbents for metal ions and dye removal for water purification, collection of precious metals and rare earths, chemical sensors and catalysts for desired chemical reactions.

- *Faster Irradiation of Food and Medical Products*

As with gamma rays, E-beams may also be used for irradiating food products for elimination of pathogenic organisms and microbial decontamination, as well as sterilizing medical products. However, electron beams can irradiate products far less time than with gamma radiation.

- *Treatment of Sewage Water*

In other countries, the accelerator's capabilities are also a welcome development in fighting pollution, particularly the E-beam's potential in "hygienizing" sewage sludge and in treating or reprocessing of waste water and flue gases.

- *Surface Curing of Inks, Coatings and Adhesives*

Electron beam cured coatings on plastic components could be produced at 750 times the speed of conventional paint or coating applicaton and drying techniques.

Strategies

- *Higher Throughputs*

Electron accelerators are capable of delivering higher dose rates than gamma radiation sources, speeding up the irradiation process. Electron beams can deposit the same energy as gamma radiation would, but in seconds instead of hours, allowing for applications which would otherwise be impractical using radiation sources since it would take extremely longer periods of time.

- *Radiation Crosslinking*

Instead of using chemicals to harden, cure or change the composition of polymer and plastic-based products, radiation from electron beams can induce the cross-linking of molecules in various materials. In cross-linking, polymers interact with each other to form a three-dimensional network, making tires, rubber sheets, wires, batteries and electrical industrial cables tougher and more resistant to heat, corrosion and chemical damage. The same process may also be applied to improve fabrics, paints, and food packaging materials.

- *Polymer Grafting*

Electron beams may also be used for polymer grafting, where polymer chains are "grown" from the surfaces of polymers. This procedure expands the possible uses of both synthetic and natural polymeric materials, proving helpful in improving the quality of these materials as well as in crafting experimental samples for research purposes.