

**CURRENT STATUS OF ELECTRON BEAM PROCESSING APPLICATIONS
AND ACCELERATOR TECHNOLOGY IN INDIA****K.S.S. Sarna, D.S. Lavale* and S. Sabharwal****Radiation Technology Development Section, Bhabha Atomic Research Centre,
Trombay, Mumbai -400 085, India***** Board of Radiation and Isotope Technology, Navi Mumbai, India****Abstract**

Electron Beam (EB) processing is now a well established technology world over in a few specific sections of the industry, particularly the polymer industry. The actual use of the technology however is dependent upon the specific socioeconomic needs of the individual country. In India, an industrial type EB accelerator has been operative since 1988 at Bhabha Atomic Research Centre, Mumbai. This 2 MeV, 20 kW machine is being utilized to develop and optimize process and material process techniques for research, development and industry in the fields viz., crosslinking, degradation and grafting of polymers; color enhancement in precious and semi-precious stones; lifetime control in semi-conductor devices; food irradiation. Some of these processes have developed into products that are now being carried out on regular commercial basis, meeting the requirements of the indian industry. These include crosslinked high temperature PE 'O' rings, wire & cable insulation, heat shrinkable tubes, micro-fine PTFE powder, degraded viscose rayon pulp and color diamonds. With the collaboration of indian cable industry, EB crosslinkable insulation formulations were developed. Suitable irradiation parameters and techniques have been studied, optimized and standardized. Over ~100 km length of cables based on PE, PVC and elastomer blends has been irradiated and the results were found to be very encouraging. Since the main parameters to be monitored in the radiation processing is the absorbed dose and its uniformity in the product, dose evaluation and optimization has been carried out specific to the process and the product under treatment. EB dosimetry based on the graphite calorimetry, thin film and alanine powder dosimeters has been standardized and being used in the facility for dose evaluation and optimization studies. An endless stainless steel mesh conveyor is available in the facility to carry out product irradiation. An eight type cable irradiation gadget has been designed, fabricated and used for irradiating cable insulation. A specially designed 4 channel beam extraction window has been procured from Russia to draw the beam pulse from 4 separate windows. Suitable cable and tube irradiation conveyor has also been installed so that uniform dose can be delivered on all the four sides of the cable. Using this conveyor, cables of 5 mm. insulation thickness can be irradiated. The accelerator is also being used for food irradiation, especially disinfestation of wheat and spices. A variety of product irradiation conveyors were designed and used for these applications. To enable the industry to have free access to the facility, the accelerator which was initially located inside BARC complex, has been shifted to Navi Mumbai, a suburban part of Mumbai and has been put into operation in May, 2001. The present facility has been designed to have increased cell and labyrinth area with entry & exit ports, accommodating continuous power roller conveyors in and out of the cell. A linear conveyor and a wire & cable transport gadget could also be placed in the cell so that any one can be

brought under irradiation zone on requirement. Substantial expertise has been achieved in the operation and maintenance of the accelerator.

Based on the studies, two cable companies are in the process of setting up a 3MeV, 50 kW accelerator in India for processing wire & cables. A 500 keV, 10 kW EB accelerator developed by BARC is in operation and would be used for surface curing applications. Based on the experience gained and the demand for the potential use of such industrial accelerators in India, a comprehensive programme has been chalked out by DAE to develop accelerators of various energies, for different applications. An Electron Beam Centre (EBC) has also been envisaged at Navi Mumbai comprising of 3 MeV, 50 kW and 10MeV, 10 kW accelerators, in order to meet the growing need of various Indian industries in applications such as wire & cables, heat shrinkable products, food and health care. This paper describes the work accomplished so far as well as the program envisaged in the development and utilization of industrial type EB accelerators for the Indian industry.