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Conceptual Development of an Irradiator for Cross-Linking of Cables Using 60Co Gamma Rays

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Setting up of new radiation Facilities

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Cross-linking provides significant commercial benefits to wire and cable insulation. Ionizing energy is an efficient means of cross-linking the polymers to improve many cable properties including insulation. In this process chemical bonds are formed between layers of polymer molecule to produce three-dimensional insoluble network. The present methods of cross-linking are thermal/chemical/e-beam from accelerators. E-beam cross-linking is the latest and improves properties like fire resistance, flame properties, abrasion resistance, stress crack resistance etc. However there is a limitation of e-beam penetration in large diameter cables (>0.030 m dia.) restricting its application. Therefore the feasibility of processing multi core cables of large diameters with gamma rays was explored. The insulation jacketing of multi core cables are made of PVC or PE. The dosimetric aspects were studied for a cable irradiator- design which has been made in such a way that the cable will move through a pipe housed in Gamma Irradiation Cells (GICs) each of which have 60Co source pencils (BRIT made BC-188) of 7.4PBq arranged around the pipe in a suitable diameter (PCD). The pipe can accommodate cables of diameters up to 0.072m. The cells have effective irradiation lengths (˜1m) and lead shielding of adequate thickness. The objective of the study was to evaluate the dose profile in cables when irradiated in a gamma irradiation cell and to optimize the PCD of source pencil arrangement to get the appropriate Dose Uniformity Ratio with the specified target dose of 100kGy & to arrive at no. of irradiation cells required for a suitable through-put. Based on the results of the study a gamma irradiator with multiple no. of irradiation cells is under development in BRIT, a unit of the Department of Atomic Energy, India.

Country/Organization invited to participate

India

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