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Dismantling case study of the radioactive effluents transport pipes at the VVR-S nuclear research reactor Magurele Bucharest

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The VVR-S nuclear research reactor owned by Horia Hulubei - National Institute of Physics and Nuclear Engineering (IFIN-HH), has functioned between 1957 and 1997 at a nominal thermal power of 2 MW, using low-enriched nuclear fuel (10%) type EK-10 and highly enriched fuel (36%) type S-36. The reactor was fitted with a 30 m³ radioactive effluents leakages pond connected by an underground pipe with two 300 m³ radioactive effluents storage ponds belonging to the Radioactive Waste Treatment Plant (STDR). The underground structures was finally build until 1965-1967 when was installed the transfer radioactive effluents pipe between nuclear research reactor 30 m³ radioactive effluents leakages pond and the two 300 m³ radioactive effluents storage ponds. The principal radionuclides implicated are the ⁶⁰Co, ¹³⁷Cs, with theirs correlation factors respectively. We used geometry simulation in close proximity with reality to observe de dose rate and activity. For dose rate assessment we use MicroShield 9.04 software on annular cylinder external dose point geometry, to simulate individual parts and integrating the results after a descriptive model corresponding with physical reality and probe factors. For a correct assessment of the activity by gamma-ray spectrometry it was necessary to have information on the activity distribution and on the full energy peak efficiency dependence on this distribution. So, detailed study of the dependence of the efficiency of the detector in the particular geometry was carried out by Monte Carlo simulation using the GESPECOR software. We developed different approach to manage the dismantling in the proper way respecting the ALARA principle. The specific activity varies from 0.43 Bq/g – 23.89 Bq/g for ¹³⁷Cs and for ⁶⁰Co values were between 0.03 Bq/g – 0.67 Bq/g. the level of contamination for the (¹³⁷Cs and ⁶⁰Co) measured during the cutting operations likely to be between: 11 Bq/cm² and 75 Bq/cm².

Biography

Ioan Iorga has been working from 2002, in several big projects like ROM 04029, BOA 3J0021 or EMERSYS. He is Senior Researcher in the decommissioning team from the NIPNE-HH Institute from Romania. Under his coordination was successfully completed the dismantling of radionuclide effluents pipes between the reactor and the treatment plant. He has published more than 10 papers in reputed journals presenting his work. He is one of main author of the VVR-S decommissioning plan. He finalized PhD at Faculty of Physics University of Bucharest with thesis studies to assess nuclear and radiological installation prior to decommissioning. Today his main research is focused in the real situation on the decommissioning field, analyzing of the radioactive waste, implementing of the simulated model and calculus in the operational radioprotection.

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