

DOSE RATE AND RISKS ASSESSMENT FOR VVR-S RESEARCH REACTOR DEPLETED URANIUM WORKSHOP

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Abstract. *The IFIN-HH VVR-S type Nuclear Research Reactor is currently in the decommissioning phase. During the operation period inside of the reactor building a workshop for mechanical processing of depleted uranium blocks was used. The purpose was containers manufacturing for biological shielding of Cs-137 and Co-60 sources. The dose rate and associated risk for workers performing clean-up and decontamination of the workshop was assessed using RESRAD Build 3.5 code. As a result of the workshop radiological characterization performed in 2007 it was revealed the presence of U-238 as dust particles embedded in the oil grease. The main risk for workers contamination was internal by aerosols inhalation as well as external by hand touching of the contaminated surfaces. The time for clean-up and decontamination operation was 2 weeks, and therefore the estimation was made for this period.*

Keywords: dose rate evaluation, risk assessment, clean-up, decommissioning, depleted uranium.

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1. Introduction

The VVR-S nuclear research reactor was used in IFIN-HH for research in physics, biophysics, and radiochemistry and for radioisotope production. It was operated at a nominal thermal power of 2 MW, maximum neutron flux of $2 \times 10^{13} \text{ n/cm}^2 \text{ s}$; It produced 9.59 GWd thermal energy using distilled water as coolant, moderator, and reflector. The Reactor used two types of fuel: EK-10, (low-enriched fuel, uranium dioxide enriched by 10% U-235 isotope, dispersed in magnesium oxide matrix) and S-36, high-enriched fuel, uranium dioxide enriched 36% by U-235 isotope, dispersed in aluminium matrix. The main purpose of reactor was radioisotope production for medicine and industrial and applications such as I-131, Mo-99 and Au-198 for medical application or Ir-92 sources for gamma-graphs and Co-60 for furnaces The VVR-S nuclear research reactor was shut down in 1997, after 40 years of operation and it is now in decommissioning phase

2. Uranium health effects

According to IAEA provisions [1], uranium is a naturally occurring radioactive element, which in the pure form it is a silver-coloured heavy metal, the same as lead, cadmium, and tungsten. It is very dense, about 19 grams per cubic centimetre, 70% more dense than lead. It is so dense a small 10-centimetre cube would weigh

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