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Opening the Goiania accident unburied waste packages

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Introduction: In 1987, in the city of Goiania, Brazil, a derelict teletherapy machine was disassembled by scavengers and Cs-137 was released in the environment, unleashing the biggest radiological accident in Brazil [1]. During the 15 days before the accident was acknowledged, some contaminated materials were sold and delivered to recycling factories in a few cities in the state of Sao Paulo, Brazil, in the form of metal scrap and recycled paper bales [2, 3]. The contaminated material was then collected, the metal scrap was conditioned in forty-three 200-liter drums, and the paper bales were stored in fifty 1.6 cubic meter steel boxes at the interim storage of the Nuclear and Energy Research Institute (IPEN), in the city of Sao Paulo, and there remained ever since.

Methodology: In 2017, 30 years later, initial analyses were performed at a sample of these boxes, checking for their activity, weight, and incongruences between the original values recorded at the time of collection and the measurement results 30 years later. The verification also intended to check if the average concentration of activity in any of the boxes had already reached the clearance limit of 10 kBq/kg [4]. A few treatment methods for volume reduction of the radioactive waste were considered, such as: wet combustion, transforming the paper bales into pulp and retaining the Cs-137 in water for later treatment, incineration, and biological degradation.

Visual inspection could not be performed at that time. Nowadays, a new set of analyses was planned. Some of the boxes previously checked were selected. A customized plastic cap was developed as a containment to prevent any leakage of Cs-137 when taking off the upper cover of the box. A transparent acrylic plate was used as a window to allow visual inspection and photographs to be taken from the interior of the box, and plastic gloves were attached to the cap to assist in opening the package and taking samples from the contaminated paper bales for laboratory tests.

Results: The results indicated that none of the boxes checked were close to the clearance limit and that, without any sort of treatment, this radioactive waste should be stored for at least 150 years more. The main objective of this work is to report the results from the evaluation of the physical state of this material. Visual analysis and sample collection of the contents inside the box were done to check for potential degradation and changes in the physical structure of the waste, by chemical or biological agents.

Conclusions: After these analyses, the treatment options for volume reduction that were previously proposed were reviewed, and the method that best suits the current characteristics of the waste was chosen.

References:

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