ABSTRACT

Treatment and Storage of LLW

The principal aim of treating and processing Low Level Waste (LLW) is reduction of size and potential hazards of the waste. This is generally achieved by conditioning it into a stable solid form that immobilizes it and provides containment to ensure that the waste can be safely handled during transportation, storage and final disposal. At CRWMF, radiological characterization methods are selected based on parameters such as the type of emitted radiation (alpha, beta, gamma, and neutron), total activity and specific activity of different radionuclides and the form of radioactivity (e.g., induced activity in a matrix, fixed and loose surface contamination, dissolved or particulate in liquids, airborne, etc.).

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Operating Experience in the Treatment and Storage of LLW in Turkey

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Direct measurement of pure beta emitters, such as tritium, C-14, Sr-90 and Ni-63, etc. generally requires destructive sampling of the waste followed by sophisticated radiochemical analysis techniques. This may require consideration of an activity (per sample) in a specialized laboratory. Measurement of alpha emitters can be accomplished either by radiochemical analysis of samples or by the use of neutron passive counting or “neutron interrogation” techniques performed on conditioned samples or waste packages.

Processing of solid radioactive waste

Solid wastes generated from research laboratories and research reactor comprises; protective cloths, contaminated papers, wooden materials, concrete, contaminated soil, spent contaminated equipment, glass, ceramics, plastic materials, metal waste, spent filters of gas cleaning systems and ion exchange resins. As can be seen in Figure approximately 12% of the waste received is solid waste.

Decontamination techniques are used at CRWMF as a waste minimization method, by reducing the contamination to levels acceptable for disposal as non-radioactive waste. Decontamination also minimizes personnel exposure during subsequent waste handling and treatment operations, to transfer waste to lower category (by decontamination) or for product recovery for reuse.

Decontamination efficiency of a material is given by the decontamination coefficient K, which is calculated by Equation K = (Ao/Ai) / Ao

where Ao = radioactivity of material surface before decontamination, Ai = radioactivity of material surface after decontamination.

Approximately 1-3 m^3/year of liquid radioactive waste received at the CRWMF is from TR-2 Research Reactor, medical applications (clinical measurements) and research laboratories in Turkey. Main radionuclides in the liquid waste include C-14, H-3, Sr-90, I-125, I-131, Te-99m, Cr-51, Co-60, Cs-137, Cs-134, Co-60, Ag-110m, Sr-90, Mo-99, Mn-54 and natural uranium. The specific activity of this stored material is not higher than 103 kBq/m^3.

Compaction is the most simple and efficient method of waste volume reduction especially for large amounts of compactable solid waste. In CRWMF, an in-drum low force (50 kN) compactor is used for compaction of solid waste (Figure 3) to achieve a volume reduction factor between 10 – 20, dependent on the type of the waste. In some cases, such as waste containing plastics only give a volume reduction of approximately 45%.