Optimization of Processes for Waste Treatment and Disposal from Facilities Utilizing Aqueous Uranyl Salt Media for Medical Isotope Production

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ABSTRACT

Argonne is assisting SHINE Medical Technologies in the development of the production of Mo-99 using accelerator driven fission in an aqueous uranyl-sulfate target solution. Development of processes for waste treatment and disposal scheme for production of 99Mo aqueous fissioning media presents a unique set of challenges for management of actinides, long-lived fission products, and environmentally labile radioisotopes. These processes drive the cost of waste disposal. Argonne has worked to develop separations schemes that can meet the necessary material throughputs and product specifications for aqueous uranyl salt-based medical isotope production, but without accounting for the impacts of the wastes generated. Work is currently underway to assess the waste streams associated with all of the key facility functions in order to ensure that streams that are especially difficult to dispose, namely mixed and GTCC wastes, are not generated. As part of this effort, Argonne evaluated the expected partitioning of components within the process flowsheets based on the known chemistries and estimated separations efficiencies. Volumes and classifications of all waste streams based on a mass balance over the entire facility have been identified. Expected waste compositions were determined from the predicted target solution evolution, distribution factors for all separations processes, and waste consolidation. Unit operations where further optimization could lead to significant reductions in waste volumes or where uncertainties related to processing have been identified for further analysis. This effort included an assessment of production schedules and identification of potential improvements to the methods for treating liquid radioactive wastes for disposal.