Public Abstract

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Title: An Investigative Approach To Explore Optimum Assembly Process Design for Annular Targets Carrying LEU Foil

Technetium-99m is the most widely used nuclear isotope in the medical field, with nearly 80 to 85% of all diagnostic imaging procedures. The daughter isotope of molybdenum-99 is currently produced using weapons-grade uranium. A suggested design for aluminum targets carrying low-enriched uranium (LEU) foil is presented for the fulfillment of eliminating highly enriched uranium (HEU) for medical isotope production. The assembly process that this research focuses on is the conventional draw-plug process which is currently used and lastly the sealing process. The research is unique in that it is a systematic approach to explore the optimal target assembly process to produce those targets with the required quality and integrity.

Conducting 9 parametric experiments, aluminum tubes with a nickel foil fission-barrier and a surrogate stainless steel foil are assembled, welded and then examined to find defects, to determine residual stresses, and to find the best cost-effective target dimensions. The experimental design consists of 9 assembly combinations that were found through orthogonal arrays in order to explore the significance of each factor. Using probabilistic modeling, the parametric study is investigated using the Taguchi method of robust analysis. Depending on the situation, optimal conditions may be a nominal, a minimized or occasionally a maximized condition. The results will provide the best target design and will give optimal quality with little or no assembly defects.