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A VISION FOR ENVIRONMENTALLY CONSCIOUS PLUTONIUM PROCESSING

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INTRODUCTION

Regardless of individual technical and political opinions about the uses of plutonium, it is virtually certain that plutonium processing will continue on a significant global scale for many decades for the purposes of national defense, nuclear power and remediation. An unavoidable aspect of plutonium processing is that radioactively contaminated gas, liquid, and solid streams are generated. These streams need to be handled in a manner that is not only in full compliance with today's laws, but also will be considered environmentally and economically responsible now and in the future. In this regard, it is indeed ironic that the multibillion dollar and multidecade radioactive cleanup mortgage that the U.S. Department of Energy (and its Russian counterpart) now owns resulted from waste management practices that were at the time in full legal compliance. It is now abundantly evident that in the long run these practices have proven to be neither environmentally nor economically sound.

The theme of this paper is that recent dramatic advances in actinide science and technology now make it possible to drastically minimize or even eliminate the problematic waste streams of traditional plutonium processing operations. Advanced technology thereby provides the means to avoid passing on to our children and grandchildren significant environmental and economic legacies that traditional processing inevitably produces. This paper will describe such a vision for

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plutonium processing that could be implemented fully within five years at a facility such as the Los Alamos Plutonium Facility (TA55). As a significant bonus, even on this short time scale, the initial technology investment is handsomely returned in avoided waste management costs.

DESCRIPTION

The maturity of advanced plutonium technology development for reducing gas, solid, and liquid radioactive waste volumes was assessed for a modern plutonium processing facility, using TA55 as the example. The most promising technologies for reducing waste streams by a target of at least 90% were selected and incorporated into flow sheets, as shown in Figures 1 and 2. Annual waste volumes and life cycle waste management costs were estimated for current missions and waste management practices. Comparison of the costs for completing the development and deployment of the advanced technologies was compared to current-practice life cycle costs. Figure 3 summarizes the return on investment for a five-year deployment strategy.

RESULTS

The assessment shows that for TA55, a total technology investment of about $12M over a five-year deployment period is not only highly cost effective, but can achieve the goal of 90% reduction in volumes of transuranic solid and liquid wastes. Indeed, the liquid waste streams can be completely converted to streams which meet requirements for industrial wastewater. The application of modern technologies therefore can not only achieve compliance requirements of plutonium processing facilities, but dramatically improve their financial and environmental performance.

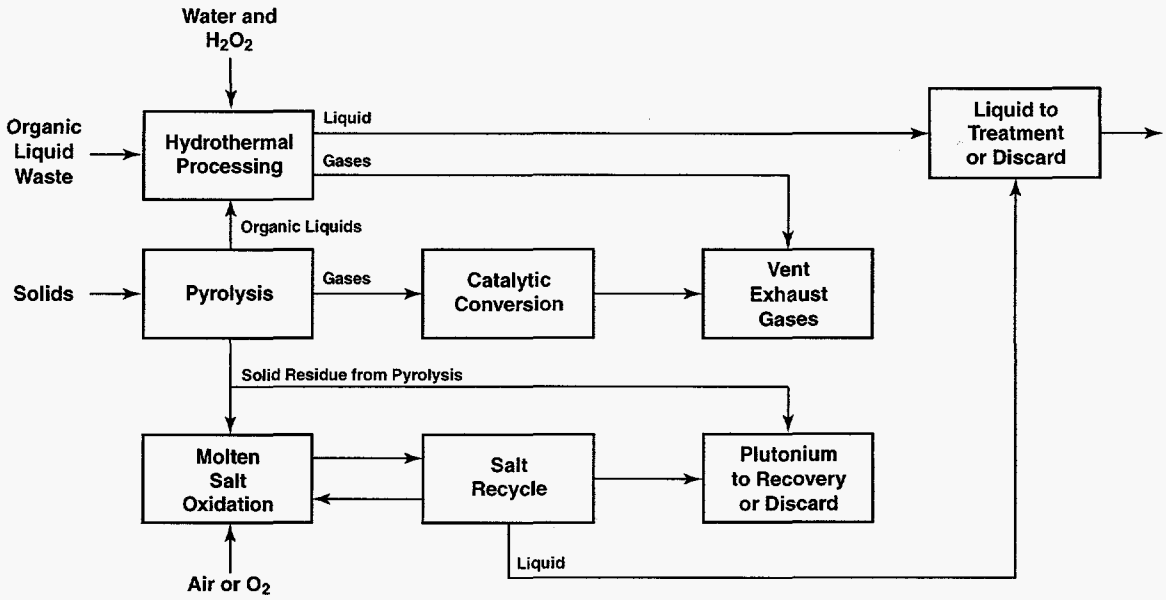

FIGURE 1. Flowsheet incorporating advanced waste minimization technologies for treating transuranic combustible materials.

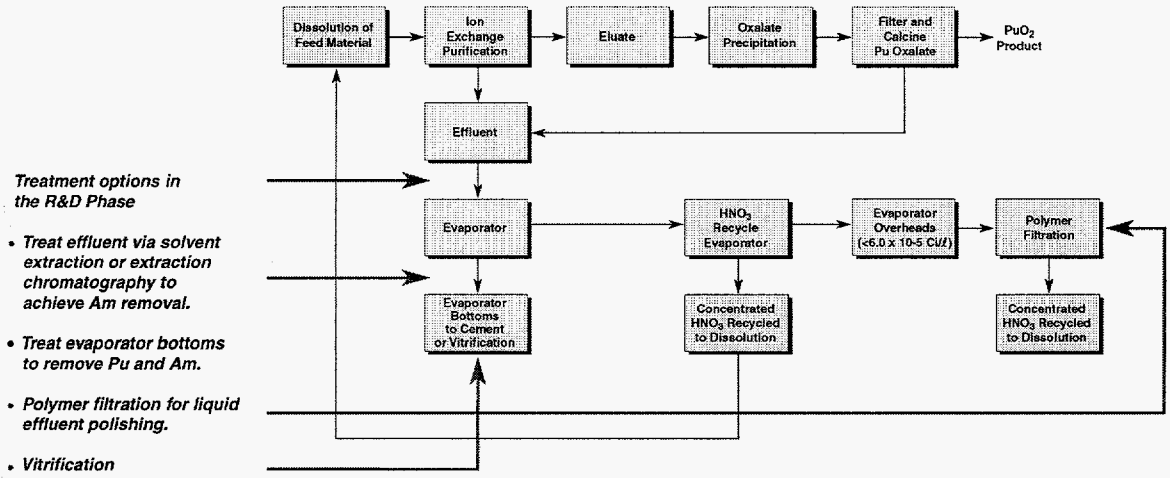

FIGURE 2. Flowsheet invoking advanced waste minimization technologies for treating radioactively contaminated nitric acid streams.

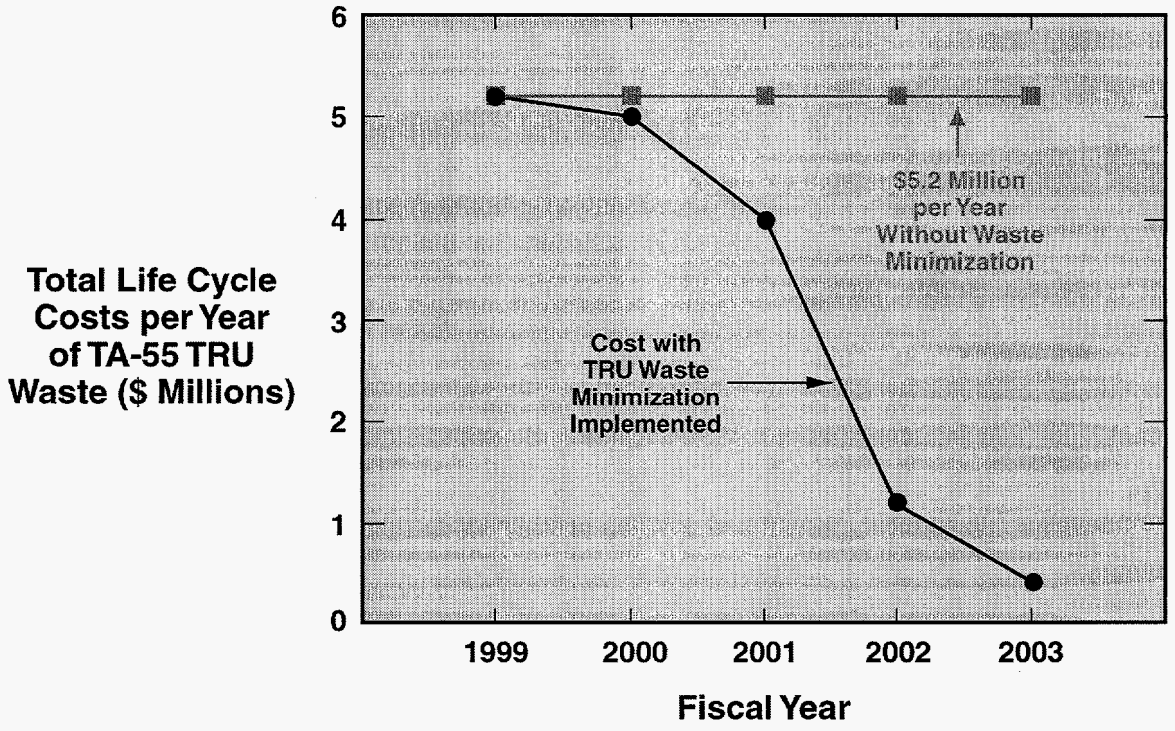

FIGURE 3. Life cycle cost avoidance by implementation of advance waste minimization technologies at the Los Alamos Plutonium Facility.