Radioactive Waste Characterization Examples

KHNP Training Program

Module 3: Waste Classification and Characterization

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Outline

I. Introduction

II. Radioisotope Thermoelectric Generators

III. Waste Oil

IV. Waste Septage

Introduction

- **The three waste streams that will be discussed are real SNL waste streams that required extensive characterization to achieve successful disposal.**

- **In the following sections, a description of the process(es) that generated these waste stream and the issues associated with their characterization will be presented.**

- **All three waste streams had the potential to be mixed waste.**

Radioisotope Thermolectric Generators (RTGs)

RTGs utilize the heat generated during radioactive decay of a high-activity sealed source (usually Sr-90) to produce electricity via the theromelectric effect. RTGs are used in remote applications where small amounts of highly reliable, low-maintenance power are required.

Because the Sr-90 activity in an RTG can be as high as 100,000 Ci (3.7xE3 TBq), they are Greater-Than-Class C waste.

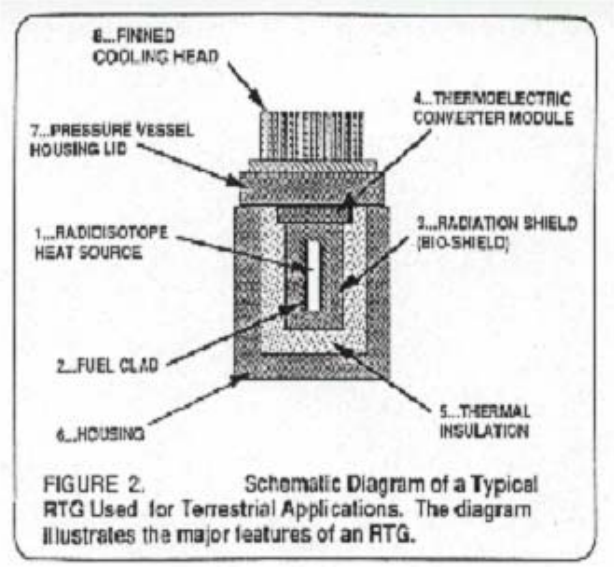

FIGURE 2. Schematic Diagram of a Typical RTG Used for Terrestrial Applications. The diagram illustrates the major features of an RTG.

RTG Disposal Issues

- **Is it mixed waste?**

  - Concentration of TCLP metals present may exceed RCRA limits.
  - Some RTGs have lead shielding.

- **Waste may be GTCC. If it is, can the Nevada Test Site take it?**

  - NTS can take high activity waste if analysis on a case-by-case basis determines that disposal of the waste in question will not exceed the NTS performance assessment requirements.

Bye-Bye, RTG

- **Based on prior analytical data for a sample that contained toxic metals concentrations analogous to the concentrations in an RTG and calculations to determine the toxic metal concentrations in the SNL RTG, waste was not mixed.**
- **SNL RTG did not exceed Class C limits for Sr-90.**

Waste Oil

SNL's California site had a tritium production facility that was decommissioned. Waste oil (30 drums, 1 5-gal container) from the facility's vacuum pumps required disposal.

DR	Form	C#	Loc	Other ID	Solids	H-3 Ci	Desc.
950041	2637	C890102	L01E1	HDRV-204/CA#534	No	3.72	Pump Oil – real full per RTR
950042	2638	C890114	L01C1	HDRV-202/CA#535	No	5.00	Pump Oil in 15 gallon DOT 17a container
950044	2601	C890116	L01C1	HDRV-218/CA#537	No	3.00	
950045	2602	C890113	L01E1	HDRV-201/CA#538	No	5.00	CPO
950046	2604	C890143	L01D1	HDRV-205/CA#539	No	3.10	
950047	2605	C890112	L01F1	HDRV-212/CA#540	???	16.2.	kimwipes per HDRV - not enough to RTR-
950051	2609	C890104	L01E1	HDRV-214/CA#544	No	2.20	
950057	2626	C890120	L01B1	HDRV-222/CA#574	No	<0.01	0.0005 Ci – hydraulic oil
950061	2628	C890105	L01D1	HDRV-219/CA#598	No	1.10	
950062	1673	C890103	L01C1	HDRV-220/CA#607	No	1.35	
950066	1678	C890118	L01D1	HDRV-215/CA#680	No	2.37	
950067	1679	C890111	L01E1	HDRV-224/CA#683	No	19.5	
950068	1680	C890101	L01F1	HDRV-209/CA#691	No	5.1	
950069	1681	C890108	L01B1	HDRV-200/CA#734	No	2.65	
950071	1683	C890121	L01B1	HDRV-203/CA#751	No	0.40	
950072	1684	C890107	L01A1	HDRV-208/CA#753	No	1.91	
950073	1685	C890115	L01C1	HDRV-207/CA#758	No	3.37.	Only half full

Waste Oil Disposal Issues

- **Is it mixed waste?**

  - High tritium levels made it difficult to find a laboratory that could run analyses.
  - Initially, documentation conflicted with personal accounts.

CA Oils Disposal

- **Waste exceeded TCLP limits for cadmium, lead and mercury.**
- **Waste was incinerated, and ash disposed of as mixed waste.**

Waste Septage

For many years, outlying buildings used by SNL for projects involving radioactive materials had their own septic systems. However, in XXX, these buildings were connected to the Kirtland AFB sewage system. As a result, septic tanks for XX buildings were cleaned out. Liquid and sludge wastes were packaged in 226 55-gal drums.

Waste Septage Issues

- **What's in this stuff?**
  - **Radionuclides?**
  - **Listed organics?**
  - **Toxic metals?**
  - **Pathogens?**
- **What about toxic gas generation? (Hydrogen, hydrogen sulfide)**

Waste Septage Analyses

- pCi – nCi levels of radioactivity
- X drums failed TCLP for toxic metals.
- X drums contained F-listed solvents.
- Tests for pathogens came back negative.

Waste Septage Disposal

- XX drums were disposed of as LLW.
- XX drums of sludge containing only TCLP metals were stabilized. After stabilization, waste passed TCLP, so drums were disposed of as LLW.
- 106(?) drums were scheduled for incineration in the Waste Energy Reduction Facility (WERF) incinerator in Idaho. However, WERF closed before waste was treated.
- WERF drums were finally incinerated at the Energy Recovery facility in Tennessee.
- X years after the start of this project, ash from the incineration was stabilized and disposed of as mixed waste at Energy Solutions.

Bye-Bye Septage!