

CHAPTER 52

Liquid Scintillation Waste

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Scintillation fluids are commonly used in many institutions for detecting low levels of low-energy beta emitters. This is particularly evident in bio-medical research institutions where radionuclides such as ^3H , ^{14}C , and ^{32}P constitute over 80% of all radioisotope usage. Once the samples have been analyzed and the results verified, they are considered waste and disposed of appropriately. At first glance this appears to be a relatively simple process, however, recently it has become increasingly more difficult.

Until a few years ago, the scintillation fluid waste containing radioisotopes was classified as either: 1. “De minimus”/“exempt quantity”, or 2. “regulated” waste.

De minimus or exempt quantity waste was defined as “any liquid scintillation fluid with less than $0.05 \mu\text{Ci/mL}$ of ^3H or ^{14}C .” This waste was exempt from regulations governing radionuclides and was, therefore, allowed to be disposed of as hazardous chemical waste in appropriate landfills.

The regulated waste, on the other hand, was that which contained any of the radioisotopes not meeting the definition of the De minimus category. This was disposed of as “low-level” radioactive waste.

This convenient disposal method was halted abruptly on July 3, 1986, when the U.S. Environmental Protection Agency (EPA) issued a notice in the Federal Register regarding the applicability of the Resource Conservation and Recovery Act (RCRA) to the management of radioactive “mixed” waste.

Mixed waste is subject to the U.S. Nuclear Regulatory Commission (NRC) because of the presence of source, special, or byproduct material. In addition, it is subject to EPA regulations because it is classified as “hazardous” under RCRA regulations.

This joint NRC-EPA jurisdiction has, in effect, stopped the disposal of mixed waste in any of the three existing low-level radioactive waste disposal sites (Beatty, Nevada; Hanford, Washington; and Barnwell, South Carolina) in the U.S. This is a direct result of having to meet the conflicting requirements of both the NRC and the EPA. See Table 1 for differences in NRC and EPA

Table 1. Differences in NRC 10CFR Part 61 Regulations and EPA Requirements Under RCRA

	NRC	EPA
Land disposal	ALARA	Prohibited unless can prove no migration
Performance objective	Sited, designed, used, operated, and closed	None (No migration)
Siting	Dry areas	Out of floor plane or withstand 100 year floor. 1/4 mile from fault
Trenches	Unlined	Double plastic-lined
Leachate collection system	No	Yes
Manifest	Each shipment	Each shipment
Sample inspection	Periodic	Incoming
Container structural stability	High integrity	None
Liquids	Absorbents (limit 1% liquid) or solidified	Lab pack
Treatment	Yes	Recommends
Storage	Allows for decay of short-lived isotopes, extended storage	Three months
Monitor	Radioactivity only	Toxic pollution
Post closure institutional control	Up to 100 years	30 years
State and federal ownership	Yes	No
Financial requirements for corrective action	Under development	Extensive and detailed

Source: "Mixed Waste Producers Face Mixed Management Rules," Environmental Management News, Vol. 3, No. 3, April 1988.

regulations. Until November of 1985, mixed waste was routinely and safely disposed of at all three sites. After that time, it became necessary for the site operators to obtain a RCRA Part B permit in order to dispose of the mixed waste. To date, no waste disposal facility has been granted such a permit.

The mixed waste disposal problems are having a serious, adverse effect on the research activities of the generators. These generators are not allowed to use storage and decay methods to convert the mixed waste into typical hazardous chemical waste prior to disposal. If a generator stores the mixed waste for more than 90 days, then it must have a federal RCRA permit to be a treatment/storage/disposal facility (TSD permit). If the generator was approved as a RCRA facility, it would be subject to significant additional regulatory requirements, as well as legal risks.

There are scintillation fluids being marketed presently which, under the current EPA regulations, are classified as nonhazardous and even biodegradable. These fluids have a potential to remedy some of the immediate problems caused by the mixed waste issue. The long term solution to the mixed waste disposal issue, however, lies with the return of full jurisdiction to the NRC. This will in no way compromise public health and safety; however it will demonstrate appropriate exertion of regulatory authority.

In addition, it is strongly recommended that major research efforts be devoted to volume reduction techniques for mixed waste.

