7640

U-005-1006.6

TECHNETIUM-99 FACT SHEET

04/00/96

DOE-FN PUBLIC
2
FACT SHEET

April 1996

FERNALD
Environmental Management Project

Technetium-99

Background
Technetium-99 (Tc-99) is a contaminant that has been found in various buildings at the Fernald Environmental Management Project (FEMP). It is a radioactive fission product resulting from the uranium-235 atom when used in nuclear reactions.

Since the FEMP supported reactor operations at DOE's Hanford site, the primary source of Tc-99 at Fernald is from the recycled low-enriched uranium returned to Fernald from purification operations (PUREX) at Hanford. Although these operations were able to remove as much as 99.9 percent of the nuclear reactor fission products before returning the reusable uranium to the FEMP, the trace quantities of Tc-99 that were sent to the FEMP followed the uranium through reprocessing operations. Enriched uranium processes contain Tc-99, and subsequent Tc-99 contamination of structures is primarily the result of spills/liquids.

Chemistry
Tc-99 primarily exists at the FEMP in a chemical state known as the pertechnetate ion. In this form Tc-99 is highly soluble, which results in a need for special focus, both in the environment and in the lab. Tc-99 is difficult to analyze in analytical samples. Special preparation techniques (to assure accurate analysis) are required when Tc-99 is known to be present. Since Tc-99 is a pure, low-energy beta radiation emitter, it is analyzed with beta-counting equipment in the lab.

Radiological Safety
Tc-99 has a relatively long half-life (the time necessary for half of the atoms to decay) of 213,000 years. However, due to its solubility, it is highly mobile and Tc-99 pertechnetate is quick to clear from living systems. A biological half-life (the time needed for half of the substance to clear the body) of about 60 hours is reported.

In addition, the beta emissions from Tc-99 are of a relatively low energy, compared to emissions from other FEMP radionuclides.

Operable Unit 3
Since the majority of Tc-99 detected in Operable Unit 3 materials was in concrete floors, Operable Unit 3 concrete disposal options have addressed Tc-99 specifically. The proposed disposal of the majority of Operable Unit 3 concrete in the on-site disposal facility was evaluated using a detailed model to predict Tc-99 migration.

As a result of studies to determine the leaching rate of Tc-99 from actual concrete samples, a conservative level of Tc-99 in the cell resulting from Operable Unit 3 wastes was determined to be 105 grams (contributions from other operable units already subtracted). In total, 127 grams of Tc-99 were conservatively estimated for the Operable Unit 3 materials (116 grams in material types proposed for on-site disposal).

To assure Operable Unit 3 wastes will not exceed the 105-gram-level for on-site disposal, the Operable Unit 3 Proposed Plan specifies that four areas of concrete from three buildings, including the most contaminated Operable Unit 3 process areas, will have contaminated layers removed and segregated for off-site disposal. This activity will reduce the Tc-99 sent to the disposal facility from Operable Unit 3 by approximately 50 percent.

For More Information

For more information regarding Tc-99 and Operable Unit 3, please contact DOE Fernald Area Office Operable Unit 3 Team Leader John Trygier, 513-648-3154.