

A Study on the Radioactive Characteristics of Soils in the Storage Facility of KAERI

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1. Introduction

In the radioactive waste storage facility at KAERI, about 3,100 drums of soil have been stored since 1988. Those soils have been managed without exact radioactivity data for each drum. During 16 years of storage, the radioactive nuclides in the soils have decayed out a lot. As those soils occupy about 27% of the storage capacity, it is necessary to treat them.

In this study, the radioactivity and nuclides of soils were analyzed to identify the radioactive characteristics of soils. After that, treatment methods for the soils were discussed.

2. Working Procedure

The radioactivity concentrations of contents of each drum were measured following the working procedure of Figure 1 developed at KAERI.

2.1 Drum Selection and Sampling

First, drums with written surface dose rate of below $0.3\mu\text{Sv/hr}$ were considered for sampling. The contents of drum was confirmed and categorized as concrete, soil or etc. and only soil drums were further treated. The surface dose rates at six points of drum were measured and the maximum value was re-written at the drum surface. After that, soils were spread on tray and mixed to make

homogenization of soil. To make representative sample, 10×10 grid was used and 30 points were used for sampling.

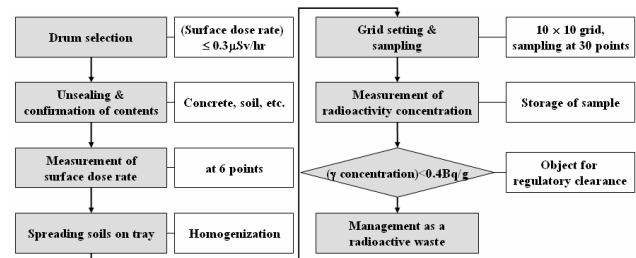


Figure 1. Working procedure for soil sampling and radioactivity concentration measurement

2.2 Measurement of radioactivity concentration

At sampling process, 2 liter sample was made from 200 liter drum and for the measurement of radioactivity concentration only 1 liter of soil was used with Marinelli Beaker. HPGe γ spectroscopy system was used for analysis. After the measurement, the samples were stored for the verification purpose. Based on the sample analysis result, soil drum was classified. If γ concentration is below 0.4Bq/g , it is classified as 'Object for regulatory clearance' and if not, 'Radioactive waste'.

3. Result of Analysis for Radioactive Characteristics

According to the measurement result for about 100 soil drums, there are only Co-60 and Cs-137 as γ -emitters. Also, the concentrations of Co-60 or Cs-137 are

very low.

Figure 2 shows the analysis result of soils for γ -radioactivity concentration i.e., summation of the Co-60 and Cs-137 concentration. As shown, about 73% of soils have a radioactivity concentration of below 0.1Bq/g and 97% of soils have a radioactivity concentration of below 0.4 Bq/g.

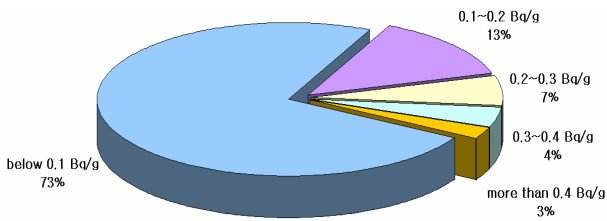


Figure 2. Distribution of radioactivity concentration of soil

4. Plan for Treatment of Soil

Recently, IAEA has published a report for regulatory clearance levels for some radionuclide [1]. The report recommends the regulatory clearance level for Co-60 and Cs-137 as 0.1 Bq/g. According to the recommendation and analysis result, about 73% of soils can be regulatory cleared.

Other study shows that up to 90% of all contaminants can be concentrated onto the fine fraction in soils [2]. Thus removing the smaller soil particles will reduce the volume of soils to be remediated and concentrated the contaminants. KAERI is planning to separate fine fraction from soil that can not be regulatory cleared using soil washing treatment. By soil washing, soils for regulatory clearance can be increased.

5. Results and Discussion

In the study, a radioactive characteristic of soils in KAERI was analyzed. The analysis results show that there are only Co-60 and Cs-137 in soils as γ -emitters. And many soils can be regulatory cleared.

Also, as we are planning to analysis all soil drums until 2009, the radioactivity can be lowered due to decay

of radionuclides. At that time the distribution of radioactivity concentration will be Figure 3. So, much more soils can be regulatory cleared following regulatory procedure without any treatment.

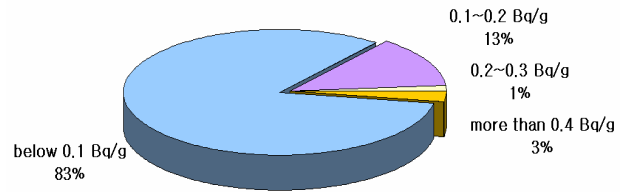


Figure 3. Distribution of radioactivity concentration of soil in 2009

The results of this study can be applied to the treatment of radioactive soils stored for certain time and be used for securing the capacity of radioactive waste storage facility of KAERI.

REFERENCES

- [1] IAEA, Derivation of Activity Concentration Values for Exclusion, Exemption and Clearance, Safety Reports Series No. 44, 2005.
- [2] R. W. Bayley and C. A. Biggs, Characterisation of an attrition scrubber for the removal of high molecular weight contaminants in sand. Chemical Engineering Journal, Vol. 111, p. 71-79, 2005.