Study on Determining Grouping Analysis Range for Low-level Radioactive Waste Using Concentration Averaging Method

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Analysis of the radionuclide concentration is essential for the final disposal of low-level radioactive waste(LLW). However, it takes a lot of time and cost to analyze the radionuclide concentration of all waste drums. To solve this issue, it is necessary to use "grouping analysis", which is a method of mixing and analyzing the samples taken from drums with the identical characteristics, and then assigning the result values equally to each drum. In this study, as a precondition for applying grouping analysis, we evaluated the allowable range of grouping for three waste types; contaminated trash which were generated during the operation of nuclear facilities in Korea Atomic Energy Research Institute (KAERI), soil and concrete which were generated during decommissioning of research reactor in Seoul (KRR-1 and KRR-2). The evaluation is performed by following process.

First, we determined the radionuclide inventories of reference waste drum for each waste type based on the radionuclide concentrations analyzed for disposal from 2015-2018. Then, waste classification was performed according to the method proposed by US Nuclaer Regulatory Commission (NRC) 10CFR part 61.55.Third, we have evaluated the maximum allowable number of grouping drums. For this evaluation, we applied the concentration averaging method of LLW proposed by US NRC. Then, we compare the total volume of grouped waste with the concentration averaging threshold based on the determined waste class and caculated factor(i.e. sum of fractions).   The result of this evaluation is shown in Table 1.

Table 1. Maximum allowable grouping drums for each waste type

Waste type	number of drums grouped (200L) (a)	Waste class	Sum of fracions	Volume of mixture (m^3) (0.2×(a) = (b))	US NRC threshold (m^3) (c)	Result (b<c)
Contaminated trash	40	C	29.57	8	20	Satisfied
Soil	1,862	A	19.99	372.4	No limit	Satisfied
concrete	1,381	A	19.99	276.2	No limit	Satisfied

To verify the evaluation results performed in this study, grouping sampling and radionuclide concentration analysis using actual radioactive waste drums are planned in further study. Through this evaluation process and further study, we expect the establishment of an optimal grouping range that can be used to the analysis of LLW.