A Study on the Clearance Strategy of Surface Contaminated Radioactive Waste Using Mass to Surface Ratio

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1. Introduction

In most nuclear and radiation facilities, a large amount of radioactive waste is generated. Therefore, many of them are considering clearance of very low level radioactive waste for economic reason. For the clearance of radioactive waste in Korea, it is necessary to satisfy the regulatory requirements of radioactivity concentration by radionuclide or exposure dose. However, clearance regulatory requirements for surface contaminated radwastes are not yet available. In USA, various studies have been carried out for solving similar problems. As a result, the relationship between surface and volume radioactivity, mass to surface ratio, has been defined and can be used to analyze the radioactivity concentration of surface contaminated radwastes. Thus, it is necessary to confirm that mass to surface ratio is applicable to analyze the radioactivity concentration of surface contaminated radwastes in Korea.

In this study, we have demonstrated clearance strategy of surface contaminated radwastes in Korea using mass to surface ratio.

2. Clearance Strategy

2.1 Overview

The schematic diagram of clearance strategy for surface contaminated radwastes is given in Fig. 1. In this paper, we have focused on analysis method of radioactivity concentration.

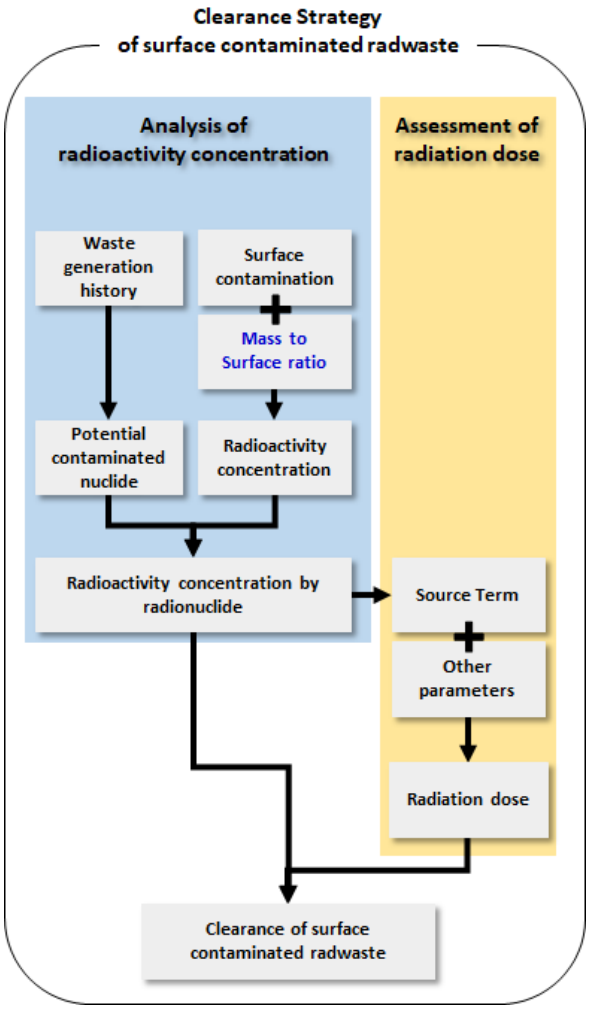

Fig. 1. Clearance strategy of surface contaminated radioactive waste.

2.2 Analysis of Radioactivity Concentration

To determine if surface contaminated radwastes satisfy the clearance level for radioactivity concentration, it is necessary 1) to select potential contaminated nuclide and 2) to analyze radioactivity concentration by radionuclide. At this time, radioactivity concentration is calculated by using

surface contamination (Bq/cm^2) and mass to surface ratio.

2.2.1 Analysis of Radionuclide. Potential contaminated nuclide in radwastes could be identified by reviewing the waste record history. Furthermore, analysis of the origin, radiation field, and surrounding environment of radiowaste should be done together.

2.2.2 Radioactivity Concentration. In order to convert measured surface contamination to radioactivity concentration, specific values are needed. In this study, the mass to surface ratio presented in USNRC has been applied. Some of values are shown in Table 1. The values were derived by analyzing the surface and volume radioactivity of the metal components of reference PWR and reference BWR. Once the mass to surface ratio is derived in USNRC, not only surface contaminated radwastes but also potential clearance radwastes are also included. Therefore, this was deduced to be more conservative than the mass to surface ratio for surface contaminated wastes. If this is applied to convert the surface contamination to the radioactivity concentration for the surface contaminated waste, it can be used as a conservative value. Thus, in this study, the mass to surface ratio was used to determine whether the surface contaminated radwastes satisfy the clearance acceptable radioactivity concentration.

Table 1. A part of mass to surface ratio information from USNRC

Material	Mean value of mass to surface ratio
Ferrous metals	4.53 – 5.34
Aluminum	0.90
Copper	0.52
Concrete	280 [1)]

[1)] Total average of all case considering USNRC studies

3. Conclusion

This study is to establish clearance strategy of surface contaminated radwastes in Korea using mass to surface ratio. In this paper, we have focused on analysis method of radioactivity concentration. We suggest the method to determine whether surface contaminated radwaste satisfies the clearance level for radioactivity concentration. 1) selecting potential contaminated nuclide by analyzing the waste record history. 2) confirming whether the radioactivity concentration satisfy clearance acceptable requirement using surface contamination using mass to surface ratio. This results will be contributed to develop the clearance strategy of surface contaminated radwaste.

REFERENCES

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