Collection of Samples for Periodically Validating the Scale Factor

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1. Introduction

Low and intermediate-level radioactive waste, generated by NPPs, are classified by pollution source, generation process and radiological characteristics. To send the low and intermediate-level radioactive waste to disposal facilities according to the low and intermediate-level radioactive waste acceptance criteria (Nuclear Safety and Security Commission Notification No. 2015-4), the concentration of the radionuclide, which accounts for more than 95% of the total radioactivity contained in the waste, investigated. For final disposal of radioactive waste in all NPPs, the scale factor for the low and intermediate-level radioactive waste, generated between 2004 and 2007, was developed. The scale factor was periodically validated every 2 years starting with the first validation in 2010 ~ 2011. The 5th periodical validation was conducted for the DAW (Dry Activity Waste), CBP (Concentrate Boric Powder), SRH (Spent Resin High) and ST (Stainless Steel) waste, generated between 2015 and 2016.

This study analyzed the waste generation of NPPs by waste type to collect the samples for the 5th periodical validation of the scale factor, and compared the radionuclide concentration of the waste to be sampled.

2. Main Subject

2.1 Waste generation

The waste, generated by NPPs, can be divided into waste generated during normal operation and waste generated during overhaul. The samples for periodical validation of the scale factor are collected from the relatively highly contaminated waste generated during overhaul from the conservative standpoint. The waste, generated by each NPP between 2015 and 2016, is as shown in Table 1.

Table 1. Radioactive waste drums (200L), generated by each NPP during normal operation and overhaul between 2015 and 2016

Classification		DAW	CBP	SRH	ST
KR	Normal Operation	675	22	22	0
	Overhaul	224	4	4	0
SKR	Normal Operation	233	0	0	0
	Overhaul	58	0	0	0
WS	Normal Operation	742	0	0	0
	Overhaul	223	0	0	0
YK	Normal Operation	924	132	21	225
	Overhaul	189	0	0	0
UJ	Normal Operation	721	181	34	0
	Overhaul	223	33	0	0

The waste generation varies, and it can be confirmed that YK NPP generated ST waste. The samples for periodical validation of the scale factor were collected from the waste generated during overhaul, and samples were collected from 292 drums as shown in Table 2.

Table 2. Radioactive waste drums (200L) of each NPP from which samples were collected

Classification	DAW	CBP	SRH	ST
KR	24	6	6	0
SKR	24	0	0	0
WS	36	0	0	0
YK	36	6	6	100
UJ	36	6	6	0

2.2 Specific radioactivity of labeled nuclides

To take out the collected samples, nuclide analysis was conducted at the site. Fig. 1 shows the specific radioactivity of ^{60}Co and ^{137}Cs by waste type.

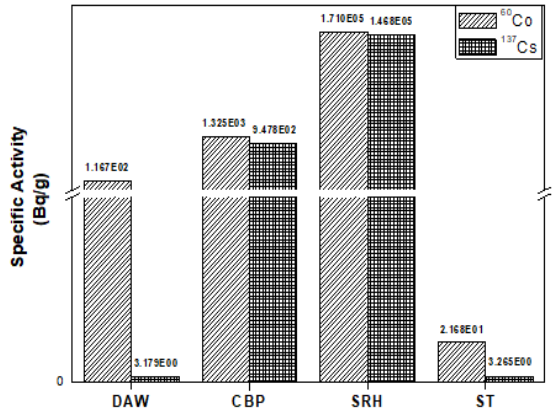

Fig. 1. Mean specific radioactivity of ^{60}Co and ^{137}Cs by waste type.

The specific radioactivity of the labeled nuclide of CBP and SRH is high, whereas the specific radioactivity of ^{137}Cs nuclide of DAW is low. Most of the ^{60}Co and ^{137}Cs nuclide are melted in the coolant system, and CBP and SRH are waste generated in the liquid treatment system. On the other hand, DAW is generated in the nuclear reactor building and auxiliary building, and ^{137}Cs nuclide is unlikely to be detected. Also, ^{137}Cs nuclide detection of DAW waste varies between existing NPPs and new NPPS. Fig. 2 illustrates the specific radioactivity of ^{137}Cs nuclide in old NPPs and new NPPs.

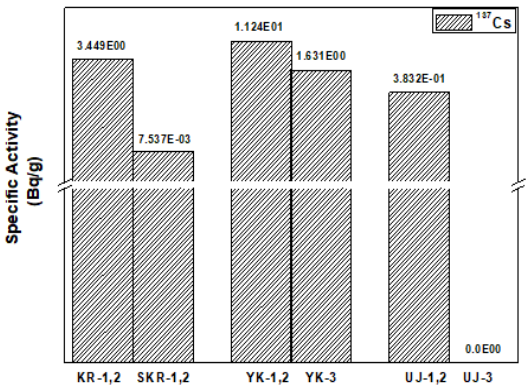

Fig. 2. Specific radioactivity of ^{137}Cs of DAW waste in old NPPs and new NPPs.

In old NPPs, not new NPPs, defective fuel is generated and corrosion products are eluted due to the damage of the fuel cladding. Due to these defects of old NPPs, ^{60}Co and ^{137}Cs nuclide are more likely to be detected in DAW waste including decontamination paper in old NPPS than in new NPPs.

3. Conclusion

Radioactive waste, generated in all NPPs between 2015 and 2016, was analyzed, and the specific radioactivity of labeled nuclides was compared. The specific radioactivity of ^{137}Cs nuclide of DAW in old NPPs and new NPPs was compared. In new NPPs, labeled nuclides were hardly detected.

4. References

[1] Sung-Wook Hong, et al 'Determination of Radionuclide Concentration Limit for Low and Intermediate-Level Radioactive Waste Disposal Facility II: Application of Optimization Methodology for Underground Silo Type Disposal Facility' Korea Radioactive Waste Society spring conference (2017).

[2] Ki-Ha Hwang, et al 'Development of Radionuclide Inventory Declaration Methods Using Scaling Factors for the Korean NPPs' Korea Radioactive Waste Society spring conference (2004).