

Development of Nuclear Waste Filter Sampling Device and Process

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1. Introduction

About 2,500 drums of intermediate-level and low-level radioactive waste are produced annually by 4 nuclear power plants in Korea, and as of September 2016, 92,008 drums (200L) are stored in the temporary storage facilities at the NPPs. The Nuclear Safety and Security Commission Notification #2015-4 requires that the concentration of the radionuclides that need to be declared during the disposition of the intermediate-level and low-level radioactive waste, possessed by Korea Hydro & Nuclear Power Co., Ltd. (KHNP), particularly the radionuclides in drums, emitting the alpha ray and beta ray, that cannot be directly measured by radiation dosimeters, should be measured. An assessment technology of the radionuclide inventory, the scaling factor, which is a method of predicting the concentration of radionuclides, was developed for the waste produced between 2004 and 2008, and the scaling factor will be used to assess the radionuclide inventory in the intermediate-level and low-level radioactive waste drums that were generated prior to 2004.

The purpose of this study is to develop a sampling device and process for analyzing nuclide in order to permanently dispose of nuclear waste filters generated before 2004.

2. Methods and Results

2.1 Establishing the plan to collect sample waste filters

As the intermediate-level and low-level radioactive waste, which were generated prior to 2004, e.g. dry active waste (DAW), spent resin and concentration waste fluid powder, except for the waste filter, is cement-solidified, the waste filter was

selected as the sample. In case of Pressurized Water Reactor NPPs, 6 systems are using filters to purify the liquid waste, and the waste filter for purifying the coolant is sampled, and different filters are used for the Pressurized Water Reactor (PWR) and the Pressurized Heavy Water Reactor (PHWR). Various filters are used respectively, and Fig. 1 and Table. 1 show the representative filters and dimensions. Also, to minimize workers' radiation exposure, radiation protection plans will be established based on the surface dose inside the storage rack where samples are collected.



Fig. 1. The image of the filters used in Wolsong nuclear power plant.

Table 1. The size of waste filter used in Wolsong nuclear power plant

Filter type	Size	
	#1	#2,3,4
¹ PHT	Primary Heat Transport	Ø482.6×1400L
² MOD	Moderator	Ø381×1090L
² SFB	Spent Fuel Bay	Ø384×1090L
³ F/M	Gland Seal	Ø127×1320L
³ G/S	Fuel Machine	Ø127×1080L

2.2 Waste filter sampling

2.2.1 Designating the radiation controlled area. In this study, samples will be collected from the storage facility of Wolsung Unit 1, which was designated as the radiation controlled area for collecting waste filter samples, and during the sampling period, it will be off limits to people other than workers.

2.2.2 Making preparations for sampling. For this study, a shielding board and tent for preventing the proliferation of contamination and equipment for collecting samples were developed, and Fig. 2 shows them.



Fig. 2. Equipment for preventing the proliferation of contamination and collecting samples.

2.2.3 Sampling procedure. The intermediate-level and low-level radioactive waste filter that were generated prior to 2004 was sampled as illustrated in Fig. 3.



Fig. 3. The procedure for sampling old waste filters.

- 1) Select the waste filters to be sampled, and open the rack from which samples will be collected.
- 2) After opening the rack, measure tritium and surface dose of the storage container
- 3) Remove the lid of the storage container, and measure the surface dose.
- 4) Measure the concentration of tritium in the workspace.
- 5) Check the waste filter storage status, and recover the waste filter and measure the dose.
- 6) Go to the waste filter tent for preventing the proliferation of contamination, measure the dose of the sampling location and make preparations for sampling.
- 7) Use the sampling device to collect waste filter samples.
- 8) Use the sealing bag to pack it, and put it in a container for transporting radioactive materials.

3. Conclusion

In this study, we developed the sampling device and process for the waste filters, and 22EA of Waste filters(PHT: 7, MOD: 2, SFB: 3, F / M: 6, G / S: 4) from Wolsung nuclear power plant were sampled. The collected waste filter samples are used for analyzing nuclide to verify the scale factor.

REFERENCES

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