Developing the Process of Collecting Samples of the Waste Filter for NPP Waste

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1. Introduction

The annual average amount of low and intermediate-level radioactive waste, generated by domestic NPPs, is 1,200 or so drums (200L), and as of December 2017, about 89,180 drums are stored in the waste repositories of NPPs. [1] Among the NPP waste generated before 2004, 709 drums of waste filters are stored, and among them, 522 drums are stored in PWR and 187 drums are stored in PHWR. PWR and PHWR waste filters are stored in different ways, and they are different types too. PWR waste filters are stored in specially made vessels (F, SH drum), and PHWR waste filters are stored in the lattice structure in the basement of temporary repositories. For final disposal of stored waste filters, nuclide analysis, required by the radioactive waste acceptance criteria, must be conducted before disposal.

This study developed the process of collecting samples for nuclide analysis to evaluate the nuclide inventory for final disposal of waste filters, generated by PWR before 2004.

2. Main subjest

2.1 Types and storage status of filters

Filters are used in various systems during operation of NPPs. In PWR NPPs, 6 systems are using filters to purify liquid waste as illustrated in Fig. 1.

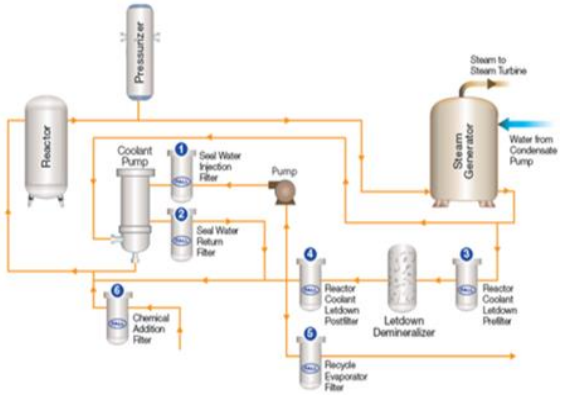

Fig. 1. Utilization of PWR filters.

Waste filters to be sampled are filters for purifying coolants, and there are many types as shown in Table 1 and Fig. 2.

Table 1. Dimensions of PWR

Filter type		Size	Volume(㎥)
RC	Reactor Coolant	6¾" OD X 20"	0.012
SI	Seal Injection	2¾" OD X 20"	0.0029
EC	Clean-up	6¾" OD X 30"	0.017
BA	Boric Acid	6¾" OD X 20"	0.012

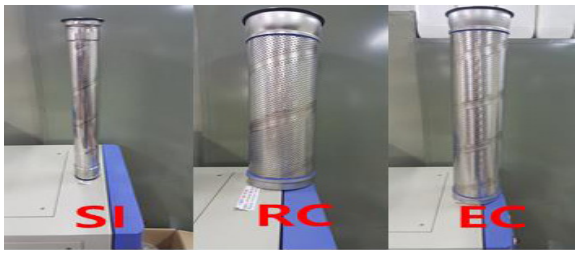

Fig. 2. Images of the PWR filter.

Filters are stored in specially made vessels (F[2], SH[3]drum), and they are made of concrete except for the inside of the vessels. The dimensions of the specially made vessels are illustrated in Fig. 3.

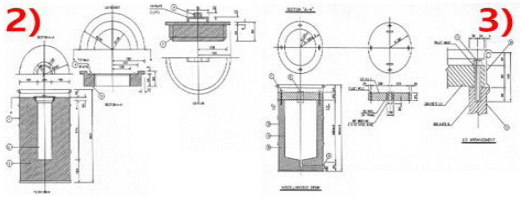

Fig. 3. Dimensions of the F drum and the SH drum.

2.2 Sampling plan

The information and storage status of selected drums are checked, and a presentation is given at the NPP where waste filters will be selected. The doses and surface doses are checked when drums are generated, and the radiation protection plan for minimizing the radiation exposure of workers is established.

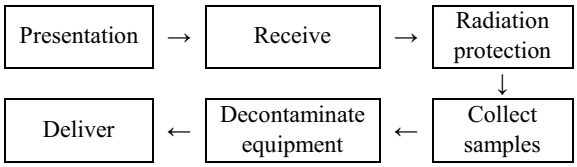

Fig. 4. Sampling procedure.

2.3 Selecting target drums and collecting samples

2.3.1 Simulation. The dimensions of the F drums, actually used in NPPs, were secured, and internal simulation samples were made. The core drill and hole cutter were used to collect samples, and a device for preventing the spread of contamination due to the cement dust, generated in the collection process, was installed as shown in Fig. 5.

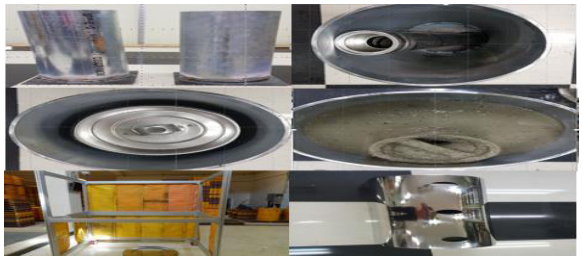

Fig. 5. Internal simulation samples and a device for preventing the spread of contamination.

2.3.2 Collecting samples. The sample waste filters for nuclide analysis included 9 from KR NPP 2, which were generated before 2004, and 1 from YK NPP 1. Samples were collected from the waste filter storage drums selected for the sampling as shown in Table 2.

Table 2. Selected waste filter drum number

Classification	Selection No.	Date generated
KR NPP 2	K20-1987-F03-0001	1987.04.14
	K20-1987-F03-0002	1987.04.14
	K20-1987-F03-0015	1987.10.25
	K20-1987-F03-0017	1987.11.03
	K20-1988-F03-0002	1988.02.16
	K20-1988-F03-0007	1988.05.23
	K20-1988-F03-0008	1988.05.23
	K24-1988-F03-0002	1988.06.12
	K23-1988-F03-0001	1988.07.08
YK NPP 1	Y1-1999-F03-0003	1999.12.30
	Y1-1999-F03-0011	1999.12.30
	Y1-1999-F03-0016	1999.12.30

Sample were collected according to the method described in Fig. 6.

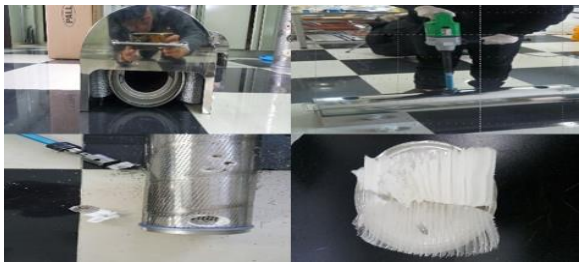

Fig. 6. Sampling procedure.

1) Establish the radiation controlled area.
2) Move the selected drums to the controlled area.
3) Install the device for preventing the spread of contamination.
4) Move the selected drums to the unit to preventing the spread of contamination.
5) Open the cap of the moved drum and measure the dose.
6) Use a breaker to remove concrete and measure the dose.
7) Opening the drum inner cap and dosimetry using automatic impact wrench and pipe wrench 8) Check inside the drum.
9) If both cement and waste filters are stored together in the drum, use the sampling device to cut the waste filter.
10) If only the waste filters are stored, use a hook to lift up the waste filter.
11) Use the core drill and hole cutter to collect samples from three locations of the waste filter.
12) Separate the collected waste filter samples from the concrete.
13) Pack the separated waste filter samples in sealed vinyl, and measure the surface dose.
14) Storage using radioactive material transport container

3. Conclusion

The simulation for collecting samples of waste filters stored in F drums and SH drums was conducted, and based on the results, the sampling procedure for preventing the spread of contamination and minimizing the exposure of workers was established.

Based on this, samples were collected from 9 waste filters in KR NPP 2 and 3 waste filters in YK NPP 1.

REFERENCES

[1] www.kins.re.kr
[2] Gwang-seop Choi, et al ‘Waste filter volume reduction method’ Korea Radioactive Waste Society spring conference (2013).
[3] Yeong-yong Ji, et al ‘Current status of waste filters stored by KAERI and their treatment plan’ spring conference (2007).