The process of self-disposal of radioactive waste from KOMAC

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1. Introduction

As part of radiation safety efforts at KOMAC, the Radiation Safety Management Team has been preparing for the self-disposal of operational radioactive waste-such as accelerator cooling system filters, air conditioning filters, and similar items-since 2023. Among them, periodic disposal is essential due to limited storage capacity.

After approximately 14 months of preparation, KOMAC successfully transferred clearance-level radioactive waste to the disposal site, thereby completing the self-disposal.

This paper presents the procedures undertaken and the outcomes of the recent self-disposal of radioactive waste generated from the 100 MeV accelerator.

2. Methods

2.1 Selection of Self-Disposal Targets

The first step in the procedure is the classification of self-disposal targets. In practice, various types of radioactive waste are generated, which are categorized into two groups: operational radioactive waste-such as air conditioning filters-and activated radioactive waste, which has been irradiated by the beam, including components such as beam dumps and beam drift tubes.

Table I : Self-disposal target

Classification	Classification	Source	Quantity (L)
Combustible	Micro-filter	Cooling system	200
	Carbon-filter		200
	Ion exchange resin filter		1,500
	Others	Replacing the filter works	300
Non-combustible	Medium-filter	Air conditioning	600
	HEPA-filter		1,400
	Charcoal-filter		400
	Damper	Conditioning system	100

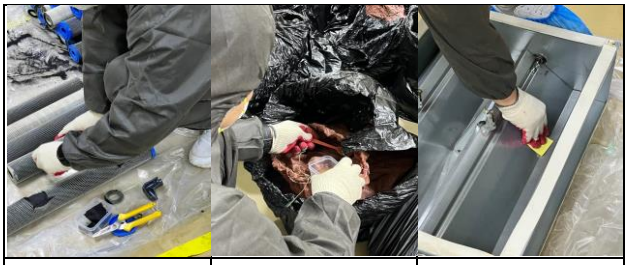
Among the various types of radioactive waste, the targets selected for self-disposal in this case are operational wastes, such as filters. Specific examples of these are listed in Table I.

2.2 Sampling for measurement

In order to demonstrate that each type of waste is acceptable for self-disposal, it is necessary to analyze a radioactivity for each nuclide to ensure that it does not exceed the clearance level.

Prior to sampling, the radiation dose rate was compared with the background level.

Samples are cut randomly into very small pieces, with one sample collected per 100 to 200 liters of waste to ensure representativeness. For components with smooth surfaces, such as damper, smear samples were collected using filter paper for radioactivity analysis.



Sampling filters	Sampling Resin	Smear damper

Fig. 1. Sample collection for analysis

2.3 Measurement by gamma spectroscopy

Unlike radioisotope facilities where specific nuclides are typically present, the accelerator facilities are contaminated by a broader range of radiation. Therefore, KOMAC use gamma spectroscopic and checked whether the activity is at the background level and satisfies the self-disposal acceptance level.

That is the reason why KOMAC analysis on all gamma nuclides to check the possibility of self-disposal.

The results of the gamma-spectroscopy analysis showed that the radioactivity concentrations of each

nuclide did not exceed the allowable limits for self-disposal, as summarized in Table II.

Table II : Clearance level of specific isotopes

Radionuclide	Clearance (Bq/g)
Na-22, Mn-54, Co-60, Zn-65, Nb-94, Ag-110m, Sb-125, Cs-134, Cs-137, Eu-152, Eu-154, Y-88, Ag-108m, Ba-133	0.1
Fe-59, Co-57, Co-58,Sr-85, Zr-95, Nb-95,Cd-109, Sn-113, Sb-124, Ce-139, Eu-155	1
Be-7, Ce-144	10
Cr-51	100

2.4 Application for Self-Disposal and Approval

According to the nuclear safety act [1], nuclear energy utilization facilities intending to carry out self-disposal of radioactive waste must prepare and submit documents that proves the radioactivity levels are below the allowable concentration for deregulation.

KOMAC submitted documents to the Korea Institute of Nuclear Safety (KINS), including the self-disposal plan, self-disposal procedures, analytical data, and a post-disposal management plan.

Following verification that both the self-disposal plan and the analysis results met regulatory requirements, KOMAC received the final approval of self-disposal.

2.5 Transportation and Disposal

After receiving approval of self-disposal plan, KOMAC removed the radiation labels from the waste containers and conducted a final verification of the waste volume and radiation dose rate. Finally, the disposal company take over the approval wastes and whole process of self-disposal completed.

Fig. 2 Work for transportation and disposal

3. Results

With the continued operation of the proton accelerator, the generation of operational radioactive waste is anticipated to increase steadily over time. In response, KOMAC established an internal radioactive waste management procedure in December 2023, initiating the classification of clearance-level waste designated for self-disposal. Beginning in 2024, KOMAC collected representative waste and analyzed using gamma spectroscopy to assess radiological characteristics. Based on the validated analytical results, KOMAC submitted an application for regulatory approval to the relevant authority in July 2024.

Following a thorough review, the Korea Institute of Nuclear Safety (KINS) issued a notification of suitability for self-disposal in November 2024. After regulatory verification, the approved waste was safely transferred to a licensed disposal company. The final disposal process was completed in February 2025.

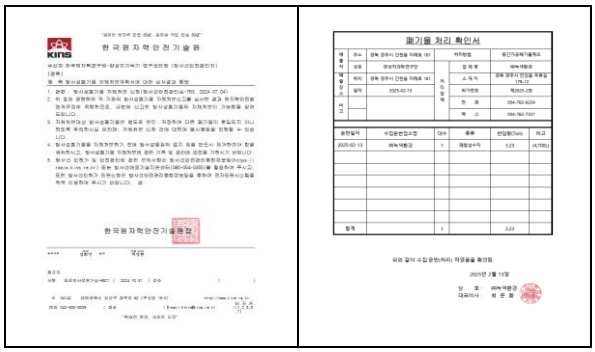


Fig. 3 Approval official document and disposition confirmation document

4. Conclusions

This case marks the first instance of self-disposal of operational radioactive waste generated from a radiation generator at KOMAC, and serves as a meaningful precedent for future cases. Given that self-disposal of such waste is relatively uncommon, this experience provides a valuable reference for establishing safe, and repeatable procedures in similar facilities moving forward.

REFERENCES

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