An Approach to the Inventory Assessment for Decommissioning Design of Nuclear Facilities

Su Jung Min[a),*], Kwan Seong Jeong[a)], Seung Kook Park[a)], San Chae[b)], and Kyung Min Kim[b)]

[a)] Korea Atomic Energy Research Institute, 111, Daedeok-daero 989beon-gil, Yuseong-gu, Daejeon, Republic of Korea

[b)] Hanyang University, **222, Wangsimni-ro, Seongdong-gu, Seoul, Republic of Korea**

*maymsj1118@gmail.com

1. Introduction

Decommissioning project of nuclear facilities is one of the biggest projects around the world. The management and tracking of decommissioning wastes generated from nuclear facilities should be carried out from their operation to final disposal phase.

In order to prepare a decommissioning plan for a nuclear facility, physical and radiological inventory evaluation should be performed. It is very important to investigate and identify the characteristics of a nuclear facility for decommissioning cost evaluation.

In this study, a method for configuration/system development of decommissioning waste management and assessment was studied for continuous management of commercial nuclear reactors (PWR, CANDU), research reactors (KRR-1&2, HANARO) and fuel cycle facilities (Post-Irradiation Examination Facility, Advanced Fuel Science Building).

2. Methods of Decommissioning waste inventory assessment

2.1 Differences from existing system

A similar system that builds characterization data of nuclear facilities is DEFACS (Decommissioning Facility Characterization DB System) of KAERI. The difference between DEFACS and the other system to be developed in this study is shown in the Table 1.

Table 1. Difference between system to be developed and existing system

	DEFACS	Development System
Concept	Facility characterization management	Waste history / Tracking management
Applicable facilities	KRR 1&2, UCP	Commercial reactor, Research reactor, Fuel cycle facilities
Input	Material, Size, Quantity, Shape, WBS code, Pictures, Surface contamination etc.	Building/Equipment/ Material ID, ISDC NO, Size, Radioactivity measurement data etc.
Output	Waste volume, Weight, Contamination /radioactivation rate etc.	Waste quantity, Radioactivity, Radioactive level of waste etc.

2.2 Methods of decommissioning waste inventory assessment for nuclear facilities

Fig 1 shows the schematic diagram of ~~the~~ analysis and assessment system of decommissioning waste inventory, which consists of PIAM, RIAM and DWAM. PIAM (Physical Inventory Assessment Module) is a module for evaluating the physical inventory of nuclear facilities using drawings and license data of each nuclear facility. RIAM (Radiological Inventory Assessment Module) is a module that evaluates radiological inventory through dose values (uSv/h, Bq/m^2) and MCNP modeling results based on nuclides derived from PIAM. DWAM (Decommissioning Waste Assessment

Module) is a module for evaluating the physical and radiological characteristics of waste by applying a radioactive waste ratio calculation. Through the proposed 3 methodologies, it is possible to determine the necessity of decontamination, to confirm the effect on the worker and the environment, and to evaluate the cost based on decommissioning processes.

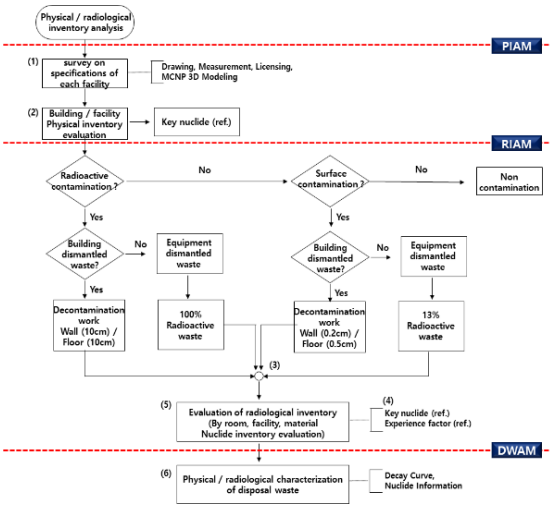

Fig. 1. Algorithm for analysis and assessment of waste inventory of nuclear facilities.

2.3 Derivation of input and output factor to build the waste assessment system

In this study, the input and output factors of system code were derived through the analysis of the existing decommissioning waste history management and assessment system. The building/system/material ID were designed to manage the physical inventory data of waste. The radiological input and output factors were distinguished by surface contamination and radioactivation, and in case of radioactivation, contamination measurement information through simulation was added. Table 2 shows the input and output factors to build the waste assessment system.

Table 2. Input and output factors for decommissioning waste assessment system

	Physical	Radiological
Input	Building/system/ Equipment/ Material ID,	Isotope information (Half-life, Decay constant etc.)
	Room/Equipment Information (Size, Material, area, Volume etc.)	Detection type (Direct, Indirect)
		Simulation(in case of radioactivation)
	ISDC No.	Radioactivity measurement data
Output	Waste quantity (ISDC NO, material, position)	Initial/Specific radioactivity data
	Waste Level	Decay curve

3. Conclusion

In order to develop the characteristics and history management system for decommissioning waste, the existing assessment system of ~~the~~ nuclear facilities was analyzed and the configuration/system classified into 3 categories (PIAM, RIAM, DWAM) were derived. The proposed inventory assessment methods and factors can be applied for ~~the~~ decommissioning of waste history management and assessment system as basic information and also can be used for the evaluation on decommissioning projects of ~~the~~ commercial reactors, research reactors and fuel cycle facilities.

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