

# Spent Nuclear Fuel Storage Rack Sampling and Process Development for Evaluation of the Radionuclide Inventory

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## 1. Introduction

Currently spent nuclear fuel is generated in 23 electricity generating reactors, i.e. 19 light-water reactors (Kori, Hanbit and Hanul) and 4 heavy-water reactors (Wolsong), and 1 research reactor (Hanaro in Korea Atomic Energy Research Institute) in Korea. The spent nuclear fuel from light-water reactors is first cooled in the storage water pool inside the reactor building. As the wet storage capacity of the spent nuclear fuel of nuclear power plants is saturated, the storage water pools were replaced by high-density storage racks, and the existing spent nuclear fuel storage racks are cut, compressed and stored in drums. Nuclear Safety and Security Commission Notification No. 2015-4 requires the measurement of the density of the radionuclides, held by Korea Hydro & Nuclear Power Co., Ltd., which must be identified during disposition of low- and intermediate-level radioactive waste, especially the radionuclides discharging alpha rays and beta rays in drums, which cannot be directly measured by radiation detectors. Accordingly, this study developed the specimen extraction and process for verifying the scale factors of existing spent nuclear fuel storage racks.

## 2. Main Subject

### 2.1 Current status of spent nuclear fuel storage racks

Hanbit Unit 1 was selected for extracting spent nuclear fuel storage rack specimens, and 262 drums were put on the spent nuclear fuel storage racks Overhaul period and Ordinary period in 2016. As illustrated in Fig. 1, the spent nuclear fuel storage racks are rectangular, made of 4M-long and 2T STS304. They are cut to a length of about 30cm,

compressed and put in drums. A device is used to extract 1 approximately 2 X 2 specimen.

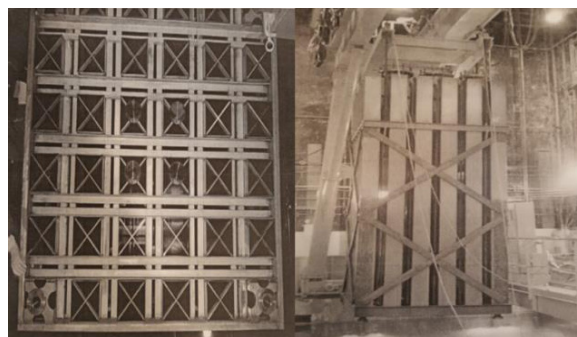


Fig. 1. Spent nuclear fuel storage rack.

### 2.2 Developing the sampling extraction process

#### 2.2.1 Setting up the Radiation Controlled Area.

The specimens were extracted in this study from the spent nuclear fuel storage racks in Hanbit Unit 1. Some drums are stored in drums in the 77ft temporary warehouse, and some spent nuclear fuel storage racks will be extracted as specimens from the 126ft fuel building before they are put in drums. To prevent the spread of dust, a tent will be installed, and it will be designated as a radiation controlled area during specimen extraction, and specimens in drums will be transported to the work space using the crane for drums. During the specimen extraction period, no one other than workers will be allowed in the radiation controlled area. To minimize the radiation exposure of workers, protective measures fit for the characteristics of the work must be taken, radiation shields must be installed, and work space must be secured. Radiation protection plans will be established based on surface dose.

**2.2.2 Preparing the sampling device.** As for devices for specimen extraction, the ready-made hydraulic punching machine and hydraulic pump will be used to extract 2 X 2cm specimen. Fig. 2 illustrates this process.



Fig. 2. Hydraulic punching machine and hydraulic pump.

### 2.3 Sampling

- 1) Prepare specimens before they are put in drums.
- 2) Use a crane to move specimens in drums.
- 3) Connect the hydraulic punching machine and hydraulic pump.
- 4) Install an immobilization frame to prevent the specimen from escaping.
- 5) Install the tent for preventing the spread of dust during specimen extraction.
- 6) Number each specimen.
- 7) Insert the prepared spent nuclear fuel storage racks into the hydraulic punching machine, and punch them.
- 8) Use the sealed vinyl to pack, and put it in the radioactive material in the ip-2 carrying container for transporting radioactive materials before transporting it.



Fig. 3. Sampling.

### 3. Conclusion

The spent nuclear fuel storage rack specimen extraction process for evaluating the radionuclide inventory was developed, and specimens were extracted from the waste from the spent nuclear fuel storage racks, which were replaced in Hanbit Unit 1 in 2016. The total weight was 91,700 kg, and a total of 10 sets of 20 specimens were extracted per 1,750 kg, which is equivalent to 5 drums. Two 2 X 2 specimens were extracted from each set.

### REFERENCES

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