Development of Automated System of Classification and Sampling on Radioactive Wastes

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1. Introduction

In Korea, radioactive wastes (RWs) of the low and intermediate level can be transferred to RWs repository of deep geological disposal (Wolsung Low and Intermediate Level Radioactive waste Disposal Center). For transfer of RWs to repository, it is necessary to evaluate radiological characteristic which is radioactivity concentration of regulated radionuclides; ^{3}H, ^{14}C, ^{55}Fe, ^{59}N, ^{63}Ni, ^{90}Sr, ^{94}Nb, ^{99}Tc, ^{129}I, ^{60}Co, ^{58}Co, ^{144}Ce, ^{137}Cs and gross alpha.

In order to evaluate the activity concentration of radionuclides, the most important issue is to prove that it is representative value for each waste drum. Previously, representative samples were collected after re-opening the packaged RWs. This approach can cause cross contamination during the re-opening process, and leads to an increase in disposal costs. In addition, it is fundamentally difficult to collect a representative sample from the packaged RWs without classification of radioactivity level because radioactivity concentration of packaged RWs is not uniform in waste drum. Therefore, an automated system has been developed to classify the radioactive level of and collect representative samples for RWs of concrete and soil which occupy a large volume of low and intermediate level wastes.

2. Conceptual design of automated system

The system consists of four steps which are 1) crushing and mixing; for making concrete and soil into particles about 10 mm, 2) transfer (Fig.2.); for moving a certain amount of wastes to each step and distributing to packaging containers, 3) classification (Fig. 3.); for classifying radioactive level of RWs as clearance, very low, low and intermediate level applying gamma spectroscopy which is used scintillation or semiconductor detector and 4) representative sampling (Fig. 4.); for sampling when distributing to packaging containers.

The number and volume of sampling can be determined according to degree of representation. In relation to this, the volume of transfer container and representative sample container are also determined. And all steps are automated and proceeded sequentially.

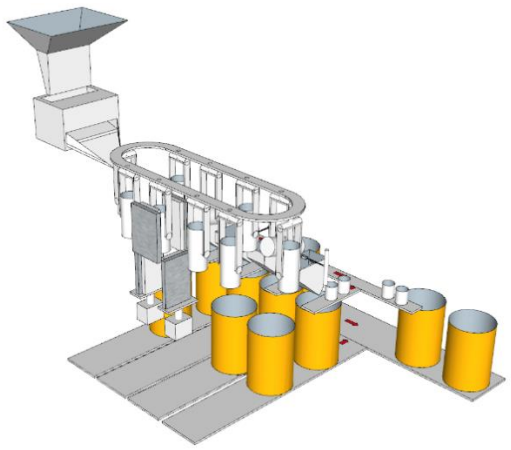

Fig. 1. Automated system of classification and sampling.

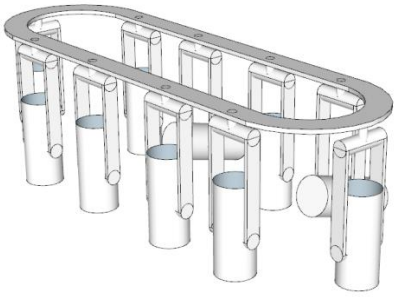

Fig. 2. Part for transfer containers.

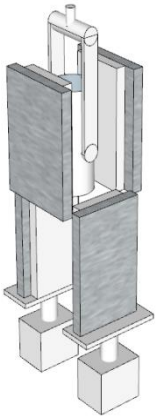

Fig. 3. Part for classifying radioactive level.

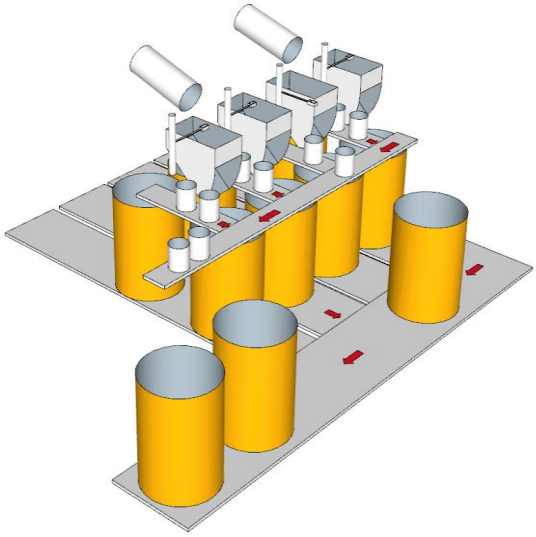

Fig. 4. Part for representative sampling.

3. Conclusion

It is possible to solve the previous problems for representativeness of sampling and to provide statistically reliable value by applying a sequential sampling method from wastes classified as clearance, very low, low and intermediate level. The radioactivity level classifying technique of this system can contribute to the reduction of the amount of waste and the cost of nuclear decommissioning by classifying the clearance level wastes out of the mixed low and intermediate level wastes. In the nuclear decommissioning market which the disposal cost of RWs is about 40% of the total cost, this study will contribute economically by improving the treatment efficiency of RWs and lowering disposal costs.