Radioactive Contaminated Soil Segregation System for Waste Volume Minimization

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1. Introduction

The permanent stop of Kori-1 is decided on June, 2017. The decommissioning of the nuclear power plant will proceed to the D&D design, decontamination, demolition, waste disposal and site restoration. Site restoration is a process of removing the contaminated soil and returning the site to a green field before the installation of a nuclear power plant. The removed radioactive contamination soil is disposed of as radioactive waste, and a high amount of site restoration costs is generated from disposal of waste. Therefore, the site restoration cost can be minimized by minimizing the radioactive waste generated at site restoration [1]. This study will demonstrate the measurement and segregation system that can minimize the generation of radioactive waste through the process of active separation of real-time radioactive contamination. The segregation are consist of two steps as particle size separation and radio activity level separation. By the new segregation system, the amount of radioactive waste can be decreased to 80%.

2. Methods of soil separation system

The radioactivity measurement of the soil is necessary to confirm whether the activity of soil is lower than the regulation criteria. The second separation is performed by the result of the measurement. In this study, the hydride segregation process using the separations by the particle size and the activation level of soil is suggested. Fig 1 presents the process of the suggested segregation for the radioactive soil in NPP remediation site. By this hybrid segregation process, the amount of radioactive waste can be decreased to more than 80%.

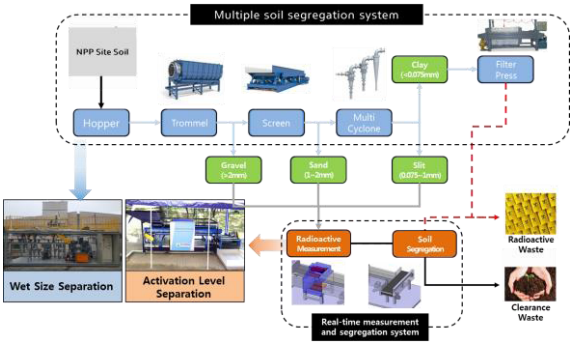

Fig. 1. Process of the hybrid segregation using the separation by the particle size and activation.

2.1 Particle size separation system

The particle size separation system is the first part of the radioactive soil segregation system. The efficiency of the particle size separation is increased using the multi-step equipment such as vibrating screens and cyclone. Fig. 2 presents the process of particle size separation. The separation efficiency of the system is better than 85%.

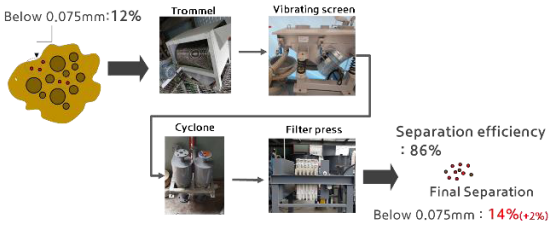

Fig. 2. Process of the particle size separation.

Fig. 3 shows the particle size separation system. The system emits the separated soil by particle to the activation level separation system using the automated conveyor system.

Fig. 3. Particle size separation system.

2.2 Soil measurement and segregation system

This is accomplished by passing the soil on a conveyor belt under an array of sensitive and rapidly reacting, radiation detectors that measure radionuclide concentrations. The contaminated soil above the desired cleanup limits is automatically diverted into a separate waste stream. As shown in fig. 4, contaminants are removed by soil measurement and segregation system. Thus, it can significantly reduce the overall amount of contaminated soil requiring disposition as radioactive waste. Fig. 5 presents the process algorithm of the activation level separation system.

Fig. 4. Real-time measurement and segregation system.

Typical radionuclides that can be measured by soil measurement and segregation system including Cs-137 and Co-60. The main factors for measurement on this system depend on the ambient radiation background, conveyor belt speed, thickness of the soil layer on the conveyor, and contaminant gamma ray energy and abundance [2].

3. Conclusion

In this study, the radioactive soil segregation system is developed using the difference of the particle size and the radioactivity level of contaminated soil. By this system, the amount of radioactive waste will be decreased to almost 80%.

REFERENCES

[1] IAEA, “Remediation of Sites with Mixed Contamination of Radioactive and Other Hazardous Substances”, Technical Reports Series no. 442 (2006).

[2] Alejandro U. Lopez, and Jeffrey W. Lively, “Application of soil Segregation Technology: Reducing Uncertainty and Increasing Efficiency at an NRC test reactor Decommissioning site”, WM2011 Conference (2011).