

Introduction to Decontamination Technology of Soil in Decommissioning NPP

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1. Introduction

Various studies have been carried out for securing the source technology related to decommissioning of NPP after permanent shut-down of Kori #1[1]. Soil decontamination technology must also be secured before decommissioning. This project is being carried out to develop the soil decontamination technology in preparation for decommissioning of Kori #1. The purpose of this project is to develop the pilot scale (1.2 m³/hr) automatic soil decontamination system that decontaminates the contaminated soil and purifies the wastewater based on the high pressure washing and ultrasonic process after classification of contaminated soil. In this paper, the soil decontamination cases and techniques in Japan and an overview of the whole process of the automatic soil decontamination system to be developed is introduced.

2. Case Study

2.1. Characteristics of soil around Fukushima area

Because of the nuclear accident, the soil around Fukushima in Japan has been extensively contaminated. At present, more than 70 decontamination companies are involved in soil decontamination and their technology has already reached a considerable level of skill. Recently they reached up to the level of recycling the decontaminated soils.

Most of the contaminated soil around Fukushima area was found to be accumulated within 1cm depth. The result of radioactivity measurement after classified into 9 levels by particle size shows that most of the radioactivity is concentrated in fine soil

with less than 75 μm diameter. (Fig. 1)

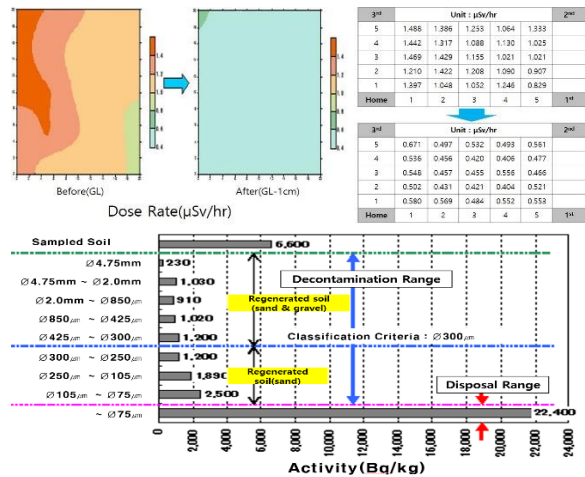


Fig. 1. Radioactivity of soil around Fukushima area.

After classifying the soil into 9 levels based on their particle size, the soils containing high radioactivity concentration, including micro-soils, are separately storing at temporary site before sending to final disposal site and the soil containing relatively low concentration are decontaminated using special decon. technology.

2.2. Decontamination technology in Japan

In Japan, various physical and chemical methods have been developed and applied to the soil decontamination. Especially, in addition to the soil decontamination technology, Japan has also developed technologies to treat organic matter such as fallen leaves and vegetation through fermentation/ decomposition, decontamination technology for river and reservoir soils, wall decontamination technology using robots, volume reduction technology using biomass and adsorption technology in contaminated water using zeolite, etc., and it contains all necessary

technologies for restoration of most environments. Fig. 2 shows an example of soil decontamination process in Japan.



Fig. 2. Soil decontamination process in Japan.

3. Pilot scale soil decontamination system

To acquire the reliability results, we are planning to take a sample from Kori site. Sample composition, particle size distribution and radiological characteristics of the soil will be evaluated first, and the decontamination range of the target soil is selected according to the result. Because various unpredictable situations can occur in decommissioning the NPP, the soil decontamination system will be developed to decontaminate for all of the generated soil during decommissioning period. The soil is firstly decontaminated by high-pressure vortex washing process, and considering the contamination degree of each soil classified by particle size, the soil with high radioactivity is additionally subjected to the combined process of ultrasonic & degassing membrane process to carry out entire decontamination.

The wastewater generated during soil decontamination is purified to minimize the generation of secondary waste by a pressurized floatation separation process with microbubble, an oil filtration process to remove trace oil in the wastewater, a coagulation & precipitation process using high functional coagulant, a wastewater treatment process using submerged MF membrane or multi-stage electric deionization, an ionic radioactive material removal process such as ion-exchange fiber or zeolite

and so on. Fig. 3 shows a schematic diagram of the soil decontamination process to be developed.

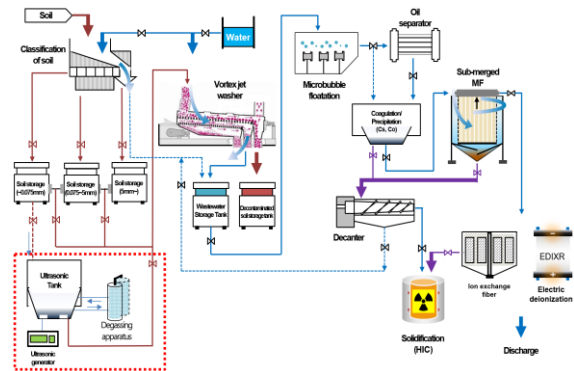


Fig. 3. Schematic Diagram of Pilot-scale Soil Decontamination Process.

4. Conclusion

Since the NPPs in Korea are expected to be gradually decommissioned, securing the source technology for decommissioning is becoming more important. Through this project, it is expected that the development of a soil decontamination system optimized for decommissioning NPP will be able to meet the domestic market demand and lay the foundations for entering the decommissioning market in the world

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