

The Development of Treatment Process Technology for Radioactive Gravel

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1. Introduction

The soil washing method holds great promise for the decontamination of contaminated soil as it is very efficient at removal and is time-effective for a great deal of contaminated soils. In addition, this method compensates for a weak point in that it generates a great deal of uranium-contaminated leachate with a short reaction time. Therefore, the soil washing method technology is a good method to remove the initial radioactive substance.

The soil dimension compositions consist of clay with small particle sizes, and gravel of larger particle sizes than clay. Also, large gravel creates several problems. Gravel weakens the intensity of the equipment. In addition, intercept soil is discharged in the equipment. And interfere with the pedal recurrence occurs. Therefore, it is necessary to classify the soil.

The gravel particle size ranges from 0.5cm to 7.5cm and the granulated gravel particle size ranges from 7.5cm to 20cm. We suppose that the radioactive concentrations are stronger in soil particles larger than the soil particle size (below a 0.5cm diameter).

The purpose of this study is to develop a soil washing system for uranium gravel and to define the most suitable operational conditions for the individual elemental equipment in a soil washing system for decontaminating the radioactive gravel from contaminated soil.

2. Methods and Results

The soil washing method in this study can be used for the decontamination of contaminated soil. We do not use the mesh filter after soil washing in order to avoid soil loss during soil washing.

The soil composition is constituted clay, gravel, and granulated gravel. Gravel with a particle size larger than 2.7cm occupies 30% of the total soil. Also, granulated gravel with a particle size larger than 10cm occupies 10% of the total.

The granulated gravel with a particle size larger than 10cm frequently generates a radioactive concentration below 0.4 Bq/g. but gravel with a particle size smaller than 10cm generates a radioactive concentration of almost over 0.4 Bq/g. Therefore, this study determines the standard assortment.

Table 1 shows the conditions for the soil washing method for uranium gravel. Nitric acid is selected as a solvent for decontamination in the soil washing method. Also, the sizes of the gravel particles range from 3.0cm to 21.0cm. The initial concentration ranges from 1.4 Bq/g to 3.0Bq/g. The gravel consists of stone at the center and soil at the surface. However, the initial concentration of gravel and granulated gravel distributes soil at the surface. Therefore, the resulting radioactive concentration is low after soil washing with a brief scrubbing time and few repetitions. Some of the gravel showed a lower concentration than the standard (below 0.4 Bq/g).

Table 1: The conditions for soil washing method for radioactive gravel.

Reagent	1.5M HNO ₃	2M HNO ₃	2M HNO ₃	2M HNO ₃
Particle size(cm)	3.0	7.0	9.0	21.0
Initial conc. (Bq/g)	3.0	1.4	2.0	2.13
Mixing ratio(g:ml)	1:2	1:2	1:2	1:2
Scrubbing time(hr)	1	1	1	1
Repeat number(time)	2	2	2	2
Removal efficiency(%) (Bq/g)	84 (0.48)	75.7 (0.73)	67.5 (0.65)	98.8 (0.25)

Granulated gravel with a particle size larger than 10cm needs a soil washing process with a one-hour scrubbing time and has two repetitions. Also, gravel

with a particle size smaller than 10cm needs a soil washing process and eletrokinetic process for decontamination.



Fig.1. the screen equipment for classification.

Fig.1. The screen equipment currently used for classification. The gravel composition of the gravel is constituted and granulated gravel. We need the two screens for sorting the gravel and granulated gravel.

3. Conclusions

Gravel has several problems. It weakens the intensity of equipment. In addition, intercept soil is discharged in the equipment. Also, interference with the pedal occurs. Therefore, it is necessary to classify the soil.

Gravel with a particle size larger than 2.7cm occupies 30% of the total soil. Also, granulated gravel with a particle size larger than 10cm occupies 10% of the total.

According to the gravel washing results, the granulated gravel with a particle size larger than 10cm needs a soil washing process that has a one-hour scrubbing time and has two repetitions. Also, gravel

with a particle size smaller than 10cm needs a soil washing process and eletrokinetic process for decontamination.

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