Calculation of Radioactivity Concentration on Cover Depth of Contaminated Zone for Self-Disposal

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1. Introduction

We have a lot of uranium contaminated soil and concrete wastes owing to dismantlement of uranium conversion facility. There are several radioactive material disposal methods such as regulation exemption, decontamination and long term storage. It is necessary for us to perform permanent disposal of these wastes. To acquire radiation dose under self-disposal from them, the study on decontamination of some uranium contaminated soil and concrete wastes was performed using electrokinectic-electrodialytic[1-7].

In this study, we evaluated radiation dose on the cover depth of contaminated zone from the wastes under radiation dose limit using RESRAD Version 6.5. At first, the calculation of the radiation dose on the wastes of contaminated zone are carried out. The second, the cover depth of contaminated zone are analyzed. The application to self-disposal of contaminated zone are also analyzed.

2. Simulation

2.1 Calculation

To perform the quantity(30,000kg) of contaminated zone, the calculating conditions for radiation dose on the cover depth of contaminated zone are as follows. The area of contaminated zone is 10 ㎡. The thickness of contaminated zone is 2 m. The length parallel to aquifer flow is 3.568m. The quantity of contaminated zone is 30,000kg. The age of the residents on contaminated zone is 15 years old. The period of evaluation on the contaminated zone is from regulation exemption of uranium contaminated soil and concrete wastes till 1,000 years.

The external radiation dose, dust intake and secondary radiation dose on the workers of contaminated zone are regarded. All the radiation doses of the residents on contaminated zone are regarded with external radiation dose, dust intake, secondary radiation dose, fruit, vegetable and grain consumption, leaf vegetable consumption, milk consumption, meat and poultry consumption, fish consumption, other seafood consumption, soil ingestion, and drinking water intake. The calculation for radiation dose on contaminated zone is carried out using the RESRAD Version 6.5.

2.2 Calculated Results

Table I show uranium concentration, radiation dose (person), radiation dose(residents) on contaminated zone for self-disposal due to cover depth of contaminated zone.

Table I: Calculating Results

Cover Depth (m)	0.75	1	1.5	2
Concen-tration (Bq/g)	1.24	3.13	7.32	29.00
Radiation Dose of Person (10μSv/y)	8.09	3.19	1.37	0.34
Radiation Dose of Residents (man·Sv/y)	0.0276	0.0109	0.0047	0.0012

Fig. 1 show uranium concentration on cover depth of the contaminated zone. As the cover depth increases, the uranium concentration has an increasing trend. The uranium concentration at 2m of cover depth rapidly increased up to 29(Bq/g). The uranium concentration over 2m of cover depth is constant as 29(Bq/g). It realize that the cover depth of contaminated zone is adequate < 2m under the condition of quantity of contaminated zone (30,000kg).

Fig. 2 show uranium radiation dose (person) on cover depth of the contaminated zone. As the cover depth increases, the radiation dose(person) has a decreasing trend. The radiation dose (person) showed a rapidly decreasing trend from 0.75m of cover depth to 1m of cover depth. Fig. 3 show uranium radiation dose (residents) on cover depth of the contaminated zone. As the cover depth increases, the radiation dose(residents) has a decreasing trend. The radiation dose (residents) showed a decreasing trend from 0.0276(man 、 Sv/y) at 0.75m of cover depth to 0.0012(man 、 Sv/y) at 2m of cover depth.

Therefore, as the cover depth increases, the uranium concentration has an increasing trend. It realize that the cover depth of contaminated zone is adequate < 2m at the quantity(30,000kg) of contaminated zone. As the cover depth increases, the uranium concentration has a

decreasing trend. As the cover depth increases, the radiation dose(residents) has also a decreasing trend.

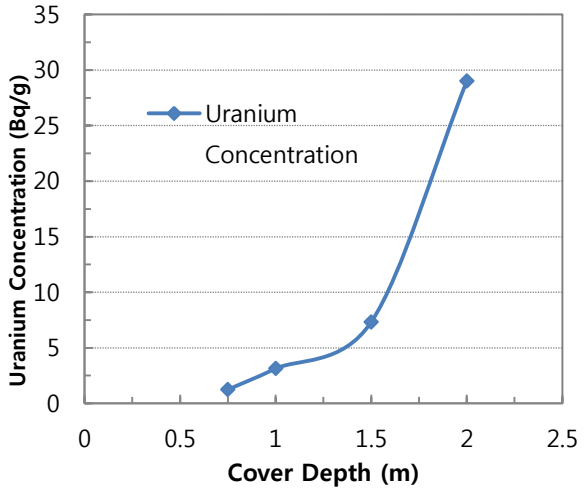

Fig. 1. Uranium concentration vs. cover depth.

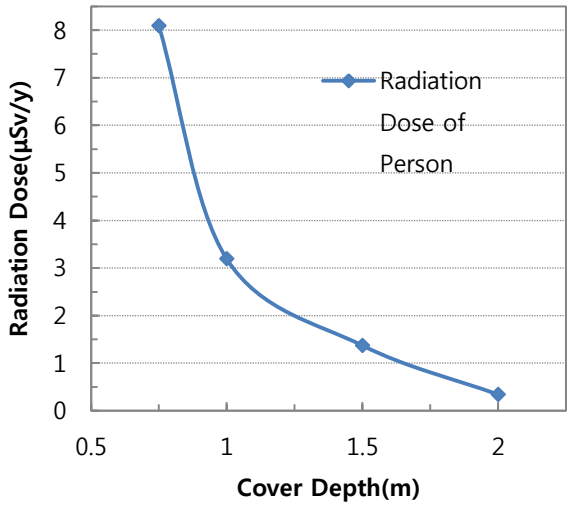

Fig. 2. Radiation dose (person) vs. cover depth.

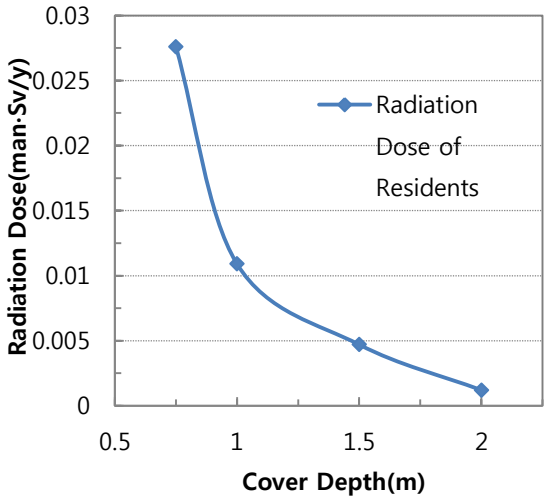

Fig. 3. Radiation dose (residents) vs. cover depth.

3. Conclusions

To acquire radiation dose under self-disposal from uranium contaminated soil and concrete wastes, we decontaminated some uranium contaminated soil and concrete wastes using electrokinectic-electrodialytic.

To perform self-disposal of the quantity (30,000kg) of contaminated zone, the calculating conditions for radiation dose on the cover depth of contaminated zone are as follows. The area of contaminated zone is 10 ㎡. The thickness of contaminated zone is 2 m. The length parallel to aquifer flow is 3.568m. The age of the residents on contaminated zone is 15 years old. The period of evaluation on the contaminated zone is from regulation exemption of uranium contaminated soil and concrete wastes till 1,000 years.

The calculation of the radiation dose on the wastes of contaminated zone are carried out. The cover depth of contaminated zone are analyzed. The application to self-disposal of contaminated zone are also analyzed. Therefore, as the cover depth increases, the uranium concentration has an increasing trend. It realize that the cover depth of contaminated zone is adequate < 2m at the quantity(30,000kg) of contaminated zone. As the cover depth increases, the uranium concentration has a decreasing trend. As the cover depth increases, the radiation dose(residents) has also a decreasing trend.

Acknowledgement

This work is supported by the Ministry of Science, ICT and Future Planning of the Republic of Korea.

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