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An Assessment on the effects of a Silo Altitude of a LLW Repository

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1. Introduction

According to the determination of the Kyungju area for a repository of Low-level Radioactive Wastes, safety assessments have been carried out by many experts. They are usually thought to be important by experts concerned about a repository of radioactive wastes, because safety assessment provides a quantitative result on the safety of a repository during the specified period of the future. In this paper, we are to make a simulation to view the radioactive effects on altitude change of silo. For the simulation, MASCOT [1] [2] code which has been used in the previous assessment is used for the construction of a basic assessment program.

2. Methods and Results

For the assessment, we establish principles to define the assessment range and to improve the assessment effectiveness.

2.1 Assessment method

For an effective assessment, we established four principles as follows;

First, it is essential to construct a basic assessment program which is consistent with the disposal system of near field and far field of the Kyungju LLW repository. The validity of the constructed program will be possible to ascertain by comparison with SAR (Safety Assessment Report) [3]. If the program is constructed well, a simulation result using the program with SAR data will be similar to that of SAR.

Second, basic input data for the assessment is obtained from SAR. Also, KOPEC data (flow velocities of ground water) measured in depth 130m, 100m and 80m are used for the altitude change assessment. Therefore, case 1(130m depth), case 2(100m depth) and case 3(80m) will be assessed and the compared with each other.

Third, it is necessary to define the assessment range. Only nuclide transport by a ground water flow is considered in this assessment. Therefore, nuclide transport by gas is not considered.

Forth, it is effective to use the MASCOT code which was used in the safety assessment for SAR. Though an additional code such as AMBER [4]code is usually used for the assessment of a biosphere, dose conversion factors for a biosphere in SAR are used in this assessment. The dose conversion factors will be reflected in the construction of the MASCOT program.

2.2 Construction of a basic assessment program

Based on the construction plan of Kyungju LLW repository, an assessment program is designed for a reference case. Overall concept of reference case means that ① each silo has its own ground water flow, ② engineered barriers are composed of waste container, backfill material and concrete silo and ③ GBI (Geosphere Biosphere Interface) is an interface area between ground water and sea. Therefore the transport path of the nuclides in the reference case is summarized by Fig. 1.

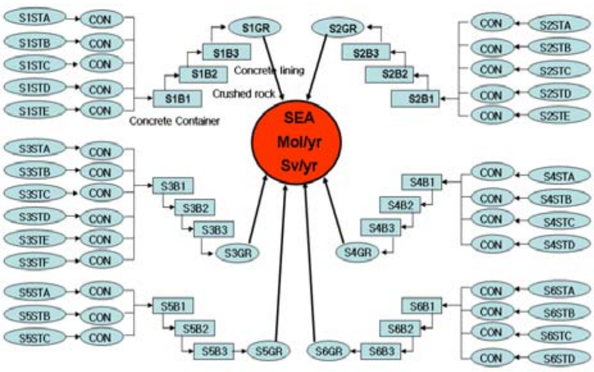

Fig. 1 Transport path of nuclides in reference case

Fig. 1 shows 6 transport paths of the nuclides depending on 6 ground water flows respectively from a source term to sea. In the program, concepts of a solubility limited source term and a simple leaching are adopted at a source term. Also, distribution coefficients of the nuclides are adopted to express the adsorption between nuclides and barriers.

2.3 Assessment 3 of cases using the program

According to the 4 principles, cases 1, 2 and 3 are assessed using the program. Almost all of the input data are obtained from SAR such as the nuclide inventories, distribution coefficients, sorption coefficient, flow velocities and others. Main differences between 3 cases are described in the table 1. To know the effects of the altitude change, flow velocities and flow lengths of a ground water flow on a far field in the basic program are replaced with data of Table 1. The program is run for cases 1, 2 and 3.

Table 1 Major difference in cases

Case	Item	#1	#2	#3	#4	#5	#6
1	Length(m)	482	527	385	424	285	328
	Travel time in GR (day)	1830	2000	1360	1530	960	1150
2	Length(m)	439	476	339	375	237	282
	Travel time in GR (day)	1460	1560	1020	1200	670	870
3	Length(m)	425	455	320	352	216	262
	Travel time in GR (day)	1340	1460	880	1070	540	740

2.4 Assessment results

From the results of program, 3 graphs are obtained. Fig. 2 is a combined graph of 3 cases and shows as follows;

First, maximum peaks of cases 1, 2 and 3 happened around 1000 year.

Second, some shifts in nuclide transport time are found between case 1, 2 and 3.

Third, altitude of the silo does not make serious effects on the total dose. In spite of this result, it is essential to obtain more detailed data and to assess it again using them, because we only used ground flow in geosphere

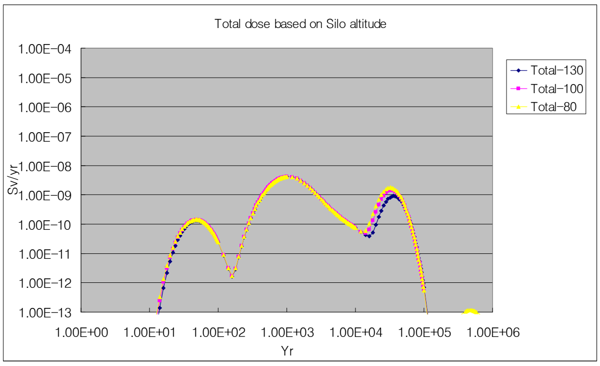

Fig. 2 Results of cases 1, 2 and 3

3. Conclusions

To observe the radioactive effects of the altitude change of a silo, a program using MASCOT was constructed and cases 1, 2 and 3 were run. Though the altitude changes of the silo do not have serious effects on the total dose, more detailed assessment will be needed.

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