Proceeding of the Korean Radioactive Waste Society
Vol. 2(1), June 2004

Application of Dose to Curie Conversion Method using MCNP-4C code for the evaluation of Radionuclide Inventory in a Radioactive Waste Container

Sang-hee, Kang, Ki-ha Hwang, Sang-chul Lee, Kun-jai Lee,
Tae-wook Kim*, Kyoung-deok Kim*, Young-hoi Herr* and Myung-jae Song*
Korea Advanced Institute of Science and Technology, 373-1 Guseng-dong, Yuseong-gu, Daejeon
*Korea Hydro & Nuclear Power Co. Ltd., 150 Duck-Jin Dong, Yuseong-Ku, Daejeon

It is necessary to perform the radionuclide inventory assessment for the disposal of low and intermediate radioactive waste containers. The γ nuclide analyzer can be used for the assessment of containers. However, if the radioactivity in the containers is extremely low or high, radionuclide inventory of the containers can not be evaluated properly. Also, gamma scanning method is time consuming and has economical burden to the utilities. In order to overcome those difficulty, dose to curie conversion method has been used to assess the radionuclide activities in waste containers in Korea nuclear power plant (KORI site) since 1996. Since then, it has added more nuclear power plant and waste containers, and there has been a research for the improvement of existing methodology in 2000. Thus, further detailed research is necessary for more precise assessment and continuous renewal of data. Dose to curie conversion method estimates the concentrations of γ-emitting radionuclides based on dose rate. The radioactivity of nuclides in containers is obtained by combining of the measured dose rate at the surface of the containers and the data of relative composition of γ-emitting radionuclides and scaling factor. In general, the dose to curie conversion factors are typically determined using computer code and are normally performed for each individual radionuclide at unity concentration in consideration of density of waste and geometry of the container. These results are used to determine the activity of radionuclide. And the α-emitting and β-emitting radionuclides are calculated by using scaling factor and the relative composition of the radionuclides. The results are used to determine the radionuclide activities. In this study, it is validated that the data calculated by MCNP-4C for the determination of dose to curie conversion factors is reliable through the comparison of the measured data in actual experiments and the calculated one by MCNP-4C. It is concluded that the difference between measured and calculated data can be occurred by the uncertainty associated with parameters, such as the assumption of homogeneity of the waste and radioactive source. For the reduction of related uncertainties and declaration of more important parameters, sensitivity analysis for related parameters should be performed.