THE RISK ASSESSMENT ON ARBITRARY ACCIDENTS ORIGNATING IN THE TSF FOR LILW MANAGEMENT

Min Ho Ahn, Won Tae Hwang, Hyo Joon Jeong, Eun Han Kim, Moon Hee Han
Korea Atomic Energy Research Institute, Daeduk-daero 989-111, Yuseong-gu, Daejeon 305-353, Republic of Korea
mhahn@kaeri.re.kr

1. Introduction

In opposition to many of researches on the disposal of LILW, the risk assessment on the TSF has scarcely been conducted. Furthermore, the details in regards of the safety analysis on this facility have not been considered in the preliminary and final safety analysis report because this report focused on the nuclear reactor system rather than this facility. As a consequence of these situations, the number of the researches on the arbitrary accidents occurring in the TSF has not been enough [1]. And then, the numbers of the researches on the predisposal management of LILW have been required for the preparation on new regulatory frame.

The objective of this study is to conduct the risk assessment on arbitrary accidents originating in the TSF for LILW management through the result of dose assessment.

2. CONSIDERATION FOR THE RISK ASSESSMENT

The total risk factor can be divided in three categories as follow [2]:

- Risk factor for fatal cancer : 5.0 x 10^{-5}risk/mSv
- Risk factor for non-fatal cancer : 1.0 x 10^{-5}risk/mSv
- Risk factor for hereditary effect : 1.3 x 10^{-5}risk/mSv

After considering the dose limit on emergency action for the public protection, the risk-level could be derived by converting the unit time (Fig. 1). And then, the table 1 indicates the risk limit (risk/mSv) with respect to each risk-level.

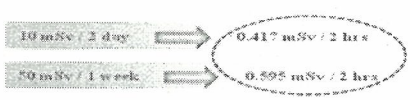


Fig. 1. The dose limit for establishing the risk-level.

Table 1. The risk limit with respect to each risk-level.

Risk-level	Dose limit (mSv)	Risk limit (mSv)
I	0.595 ≤	4.344×10^{-5} ≤
II	0.417 ≤ ~ < 0.595	3.044×10^{-5} ≤ ~ < 4.344×10^{-5}
III	< 0.417	< 3.044×10^{-5}

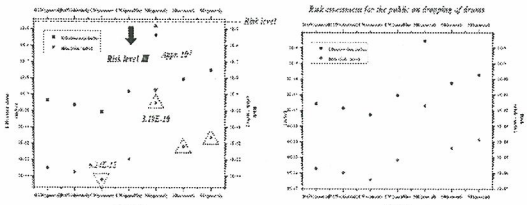
3. RISK ASSESSMENT ON ARBITRARY ACCIDENTS ORIGINATING IN THE TSF FOR LILW MANAGEMENT

In this study, seven waste streams were considered for risk assessment on arbitrary accidents originating in the TSF for LILW management: the general DAW (200 L), the shielded DAW (200 L), the concentrated waste solidified by cement (200 L), the concentrated waste stabilized by paraffin (200 L), the general spent resin (200 L), the spent resin solidified by cement (200 L), and the general spent filter (200 L). The assumptions for risk assessment are as follow:

- The number of damaged drums for the dropping of drums : 20
- The number of damaged drums for the fire : 80
- The drums generated in 1995 were used for the risk assessment (conservative approach)

Figure 2 (a) shows the risk corresponding to the effective doses resulting from the dropping of drums for workers. Figure 2 (b) indicates the risk corresponding to the effective doses resulting from the dropping of drums for the public. The risk with respect to each waste stream for workers was a hundred-fold higher than those for the public. The risk on all of waste streams originating from the dropping of drums for workers and the public didn't exceed the risk-level III. Furthermore, the waste stream for which the effective dose was the highest

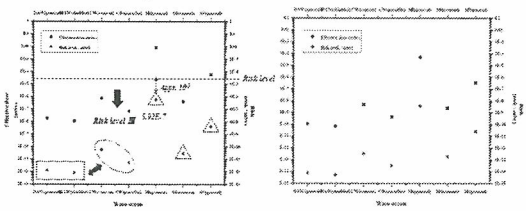
was the general spent resin regardless of workers and the public. And then, the risk of the concentrated waste solidified by cement was the lowest.



(a) (b)

Fig. 2. Risk assessment on the dropping of drums (a) for worker, (b) for the public.

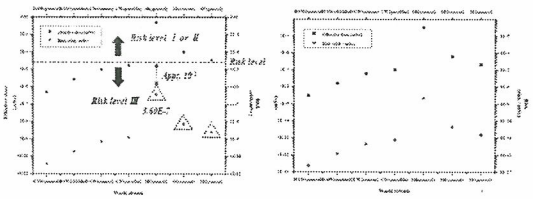
Figure 3 (a) shows the risk corresponding to the effective doses resulting from the fire for workers. Figure 3 (b) indicates the risk corresponding to the effective doses resulting from the fire for the public. The risk with respect to each waste stream for workers was about one hundred-fold times than those for the public. The risk on all of waste streams originating from the fire for workers and the public didn't exceed the risk-level Ⅲ. Furthermore, the waste stream for which the effective dose was the highest was the general spent resin regardless of workers and the public. And then, the risk of the concentrated waste solidified by cement was the lowest. Also, the risk in regard of the shielded DAW was relatively lower than concentrated wastes solidified with cement and stabilized with paraffin.



(a) (b)

Fig. 3. Risk assessment on the fire (a) for worker, (b) for the public.

The results on risk assessment plotted from the figure 2~3 were evaluated by considering the releasing rate with respect to the waste stream and radionuclide on the main risk factors: the dropping of drums and fire. However, in cased of no considering the releasing rate suggested in the NUREG/CR-4370, the results on risk assessment could be higher than those considering the releasing rate. Although the releasing rate was not considered in regard of the waste stream and radionuclide on the dropping of drums and fire, the risk on all of waste streams originating in the TSF for workers and the public didn't exceed the risk-level Ⅲ like the case of the risk assessment considering the releasing rate (Fig. 4 (a)~(b)).



(a) (b)

Fig. 4. Risk assessment in case of no considering the releasing rate (a) worker, (b) for the public.

4. Conclusions

In order to conduct the risk assessment on arbitrary accidents originating in the TSF for LILW management, the result of dose assessment was converted to the risk index. The risk conversion parameter for deriving the risk index was considered in the concept of the total risk factor suggested in the ICRP. After considering each parameter, the total risk factor was represented by the value of 7.3E-5 risk/mSv in terms of risk dimension. And then, the risk-level was also derived with respect to each risk degree. Consequently, the risk-level of all of drums was Ⅲ regardless of waste stream with respect to the dropping of drums and fire. Especially, the risk originated in dropping of drums could be ignored.

5. References

[1] M.H. Ahn, etc., "Establishment of risk-based accident scenarios using the mater logic diagram related to LILW management in the temporary storage facility", Annals of Nuclear Energy 35, pp. 2420-2425 (2008).

[2] ICRP, ICRP Publication 60: 1990 Recommendations of the International Commission on Radiological Protection, Elsevier, (1990).