Radioactive Inventory Calculation of KARTINI TRIGA Reactor for Decommissioning Scenario Development

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The flux distribution and the radioactive concentration were calculated using PHITs and DCHAIN-SP. The radioactive waste category of each reactor component was determined based on its time-dependent radioactive concentration distribution. This information was applied to decide the waste management options such as disposal/storage, and clearance.

Keywords: *TRIGA Reactor, radioactive waste management, decommissioning, activation calculation, waste category*

1. Introduction

It is important to estimate the volume of radioactive waste as precisely as possible to study scenarios of decommissioning KARTINI TRIGA Reactor with the timeframe to its completion. The objective of the present study is to calculate the radioactive inventory of the reactor by segmenting the big components into smaller part to allow the categorization of the decommissioning waste more precisely.

2. Methodology

We employed the Monte Carlo method based code, PHITs (Particle and Heavy Ion Transport code System) to calculate the neutron fluxes distribution on reactor components. Next, the result of PHITs then used in DCHAIN-SP to calculate the neutron activation in reactor components. Neutron flux distribution in core was extracted from the Safety Analyses Report (SAR) of the KARTINI Reactor and then treated as a fixed source in PHITs simulation. In the current modelling, the biological shielding was segmented to be several sections in such that the flux value and the radioactivity concentration will also be determined for each section. Then the calculation result will be compared to the calculation in which the biological shielding was treated as a single part with a single flux value and radioactivity concentration.

3. Results and Discussion

Table: Volume of Radioactive Waste

The radioactive waste volume from the reactor structure some years after the shutdown of the reactor is shown in the graph. It is shown that by segmenting the biological shielding, the total amount of VLLW decreased drastically compare to the one piece case. For 10 years after the shutdown, the total VLLW will be less than 5 m^3, which is small enough to be anticipated by the available radioactive waste storage facility. This condition resulting the immediate dismantling (10 years after reactor shutdown) become much more feasible.

4. Conclusion

By segmenting the biological shielding to be some parts, resulting the amount of VLLW much lesser compare to treat the biological shielding as a single part. From the point of view of radioactive waste amount, the immediate dismantling become much more feasible to be chosen as the decommissioning scenario

References

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