ABSTRACT

The SPINNOR model reactor, an abbreviation of Small Pb-Bi Cooled No-Onsite Refueling Nuclear Reactor, is a form of innovation in the Small Modular Reactor (SMR) category that is designed to be safe, efficient, and environmentally friendly by utilizing thorium as an alternative fuel option. This study aims to analyze the neutronic parameters of the SPINNOR fast reactor. The fuel used is thorium nitride (ThN) and uranium nitride (UN), with variations in fuel fractions of 55% and 60%. Simulations are carried out using the Monte Carlo method using the Monte Carlo N-Particle (MCNP) code. The optimal design of the code created must meet the requirements that have been reviewed in the reference for the specified geometry and material. The acquisition of simulation output data needs to be reviewed again if it does not meet the provisions and requirements of the optimal design in the reactor. From the simulation results, it is known that the 55% fuel fraction at 225 MWth power is a more efficient design in terms of burnup level parameters and its neutron flux is recorded as the most significant. Meanwhile, the 60% fraction actually has the longest critical period, reaching more than 10 years, with an average excess reactivity value of around 14.35%. It should also be noted that the SPINNOR reactor with ThN and UN fuel at a capacity of 225 MWth is actually categorized as a converter and burner reactor (not a breeder reactor), because the initial conversion ratio (CR) value is only 0.37. The study for this model reactor has approached the value of the results of previous studies with variations in fuel fractions and fuel materials. This research is expected to serve as a reference material and provide input for the development of thorium-fueled nuclear reactor technology in Indonesia.

Kata Kunci : *Thorium, Small Modullar Reactor (SMR), Monte Carlo, neutronic*