ABSTRAK

Radiasi memiliki efek samping bagi setiap pekerja radiasi apabila tidak diantisipasi secara khusus. Modeling *shielding* diperlukan sebagai proteksi radiasi bagi pekerja radiasi reaktor. Penelitian ini bertujuan untuk mengetahui laju dosis radiasi neutron dan gamma pada sistem *shielding,* mengetahui spektrum radiasi yang terserap oleh *shielding*, dan mengetahui material *shielding* yang tepat untuk keselamatan pekerja radiasi berdasarkan metode Monte Carlo dengan simulasi program PHITS. Penelitian dilakukan III tahap, yaitu: tahap I memodelkan *shileding* sesuai *modeling shielding* BATAN dengan material utama parafin dan aluminium, tahap II menetukan laju dosisi radiasi beserta spektrum energi yang bersumber dari lubang *aperture* terhadap *soft tissue* secara simulasi, dan tahap III melalukan analisis, dimana *shielding* menyerap radiasi hingga batas laju maksimum BAPETEN yaitu 10,42 µSv/jam dengan lama waktu pekerja 1920 jam dalam satu tahun. Berdasarkan hasil penelitian, Material parafin, aluminium, dan timbal efektif sebagai moderasi radiasi dengan ukuran secara keseluruhan *shielding* setelah optimasi (2,32 x 1,313 x 2,012) m^3. Laju dosis maksimum radiasi neutron dan gamma setelah optimasi dipermukaan luar *shielding* masing-masing adalah 5,28 µSv/jam pada posis sumbu-Z 0 cm dan 62,2 µSv/jam pada posisi sumbu-Y 120 cm dan hasil ini adalah masih dibawah batas maximum radiasi yang diizinkandesain. Sedangkan spektrum radiasi yang terhambur mengalami penurunan terhadap material *shielding* diketahui melalui rentang fluks energi yang dihasilkan dari simulasi. Sebelum neutron memasuki *shielding* dan neutron berada pada sistem *shielding* secara berurut puncak nilai fluks energi 3419,1 MeV/cm^2s dan 12,3 MeV/cm^2s. Sedangkan untuk gamma secara berurut nilai fluks energi 0,0056 MeV/cm^2s dan 0,00014 MeV/cm^2s

Kata kunci: *shielding*, laju dosis radiasi, spektrum energi, PHITS

ABSTRACT

Radiation has side effects for each radiation worker if it is not specifically anticipated. Shielding modeling is needed as radiation protection for reactor radiation workers. This study aims to determine the neutron and gamma radiation dose rates in the shielding system, determine the spectrum of radiation absorbed by shielding, and find out the right shielding material for the safety of radiation workers based on the Monte Carlo method with the PHITS program simulation. The research was carried out in three stages, namely: stage I modeling shielding according to BATAN modeling shielding with the main material paraffin and aluminum, stage II determining the rate of radiation composition and energy spectrum originating from the aperture hole on the soft tissue in simulation, and stage III analyzing, where shielding absorb radiation up to the maximum BAPETEN rate limit of 10,42 µSv / hour with a working time of 1920 hours in one year. Based on the results of the study, Based on the results of the study, paraffin, aluminum and lead materials are effective as radiation moderation with the overall size of shielding after optimization (2,32 x 1,313 x 2,012) m^3. The maximum dose rates of neutron and gamma radiation after optimization on the outer shielding surface were 5.28 µSv/hour at the Z-axis position 0 cm and 62,2 µSv/hour on the Y-axis position 120 cm and this is still below the maximum permitted radiation limit. While the spectrum of the scattered radiation has decreased with the shielding material known through the range of energy fluxes generated from the simulation. Before the neutrons enter shielding and neutrons are in the shielding system, the peak energy flux value 0,0043 MeV/cm^2s and 3419,1 MeV/cm^2s. As for the sequential gamma energy flux value 0,0064 MeV/cm^2s and 0,00014 MeV/cm^2s.

Kata kunci: *shielding, radiation dose rate, energy spectrum, PHITS*