ABSTRAK

DESAIN INTI REAKTOR SCWR *(SUPERCRITICAL WATER REACTOR)* MODEL TERAS SILINDER *(R, Z)* DENGAN BAHAN BAKAR THORIUM HASIL DAUR ULANG

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Penelitian desain inti reaktor air superkritis (SCWR) model teras silinder dua dimensi *(r, z)* menggunakan program SRAC telah dilakukan. Kode dasar SRAC yaitu PIJ dan CITATION. PIJ digunakan untuk perhitungan tingkat sel bahan bakar dan CITATION digunakan untuk perhitungan tingkat teras reaktor. Perhitungan teras reaktor dilakukan pada ¼ bagian teras silinder *(r, z)* dan geometri sel bahan bakar berupa sel silinder. Material bahan bakar yaitu thorium dengan *burn up* 40 GWd/t dan 30 GWd/t. Parameter neutronik pada penelitian ini meliputi persentase pengayaan bahan bakar, *burn up*, ukuran teras reaktor, konfigurasi teras reaktor, faktor multiplikasi, dan distribusi rapat daya. Faktor multiplikasi (*k*-effektif) yang diperoleh pada penelitian ini sebesar 1,000004, dimana reaktor berada dalam kondisi kritis. Teras reaktor berada dalam kondisi kritis pada ukuran radius (r) 130 cm, tinggi (z) 270 cm dan pengayaan bahan bakar 2,8262 %. Rapat daya maksimal yang diperoleh sebesar 130,0808 Watt/cm^3, terletak pada radius 25 cm dan tinggi 135 cm. Faktor puncak daya pada arah radial yaitu 1,6063 dan faktor puncak daya pada arah aksial yaitu 1,3189.

Kata Kunci: desain inti reaktor, rapat daya, SCWR, SRAC, thorium

ABSTRACT

DESIGN OF CORE SCWR (SUPERCRITICAL WATER REACTOR) REACTOR WITH CYLINDRICAL (R, Z) CORE MODEL USING RECYCLED THORIUM FUEL

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The Research of the supercritical water reactor (SCWR) core design of the two-dimensional cylinder core model (r, z) using the SRAC program has been done. The SRAC basic code was PIJ and CITATION. PIJ was used to calculate the fuel level and CITATION was used to calculate the reactor core level. The calculation of the reactor core has been done on the 1/4 cylinder core (r, z) and the geometry of the fuel cell was the cylindrical cell. Reactor fuel material was thorium burned 40 GWd/t and 30 GWd/t. The neutron parameters in this research were fuel enrichment, burn up, reactor core size, reactor core configurations, multiplication factor, and power density distribution. Multiplication factor (k-effective) in this research was 1.000004, which is reactor was in a critical condition. The reactor core in critical condition had the size of radius (r) was 130 cm, height (z) was 270 cm and fuel enrichment 2.8262 %. The maximum power density was 130.0808 Watts /cm^3 which was located at a radius of 25 cm and 135 cm high. The peak power factor in the radial direction was 1.6063 and the peak power factor in the axial direction was 1.3189.

***Keywords**: reactor core design, power density, SCWR, SRAC, thorium*