

ABSTRAK

ANALISIS *BURN UP MODIFIED CANDLE HIGH TEMPERATURE GAS REACTOR* (HTGR) DENGAN BAHAN BAKAR URANIUM ALAM (NITRIDA)

Oleh

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Telah dilakukan penelitian tentang analisis *burn up modified CANDLE High Temperature Gas Reactor* (HTGR) menggunakan bahan bakar uranium alam dengan desain geometri bahan bakar berbentuk heksagonal model IGT-12 pada $1/2$ bagian teras reaktor arah radial. Tujuan dari penelitian ini meliputi penentuan geometri sel, ukuran pin bahan bakar, fraksi volume, kekritisian, densitas atom, rasio konversi dan distribusi rapat daya. Parameter yang dianalisis dari penelitian ini meliputi kekritisian, densitas atom, rasio konversi dan distribusi rapat daya. Hasil yang didapatkan pada penelitian ini adalah nilai faktor multiplikasi (k_{eff}) sebesar 1,1612 dan nilai faktor infinitif (k_{inf}) sebesar 1,1612. Didapatkan nilai rasio konversi 0,6622 dan nilai densitas atom mengalami perubahan jumlah nuklida pada jenis nuklida U^{235} sebesar $2,3697 \times 10^{24}$ atom/cm³ dan Pu^{239} sebesar $7,5893 \times 10^{22}$ atom/cm³ pada periode *burn up* 70 tahun. Nilai rapat daya maksimum sebesar 64,381 Watt/cm³, faktor puncak daya sebesar 2,1303 (arah radial) dan 1,3978 (arah aksial).

Kata kunci : *Burn up*, densitas atom, reaktor HTGR, uranium, rapat daya

ABSTRACT

ANALYSIS OF BURN UP MODIFIED CANDLE HIGH TEMPERATURE GAS REACTOR (HTGR) USING NATURAL URANIUM (NITRIDE) FUEL

By

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The research on the analysis of burn up modified CANDLE High Temperature Gas Reactor (HTGR) using natural uranium fuel with a hexagonal fuel geometry design model IGT-12 at $1/2$ radial direction of the reactor core has been carried out. The objectives of this study are determining cell geometry, fuel pin size, volume fraction, criticality, atomic density, conversion ratio and power density distribution. The parameters analyzed in this study are criticality, atomic density, conversion ratio and power density distribution. The results obtained in this study were the effective multiplication factor (k_{eff}) is 1.1612 and the infinite factor (k_{inf}) is 1.1612. The conversion ratio about 0.6622 and the atomic density about of the U^{235} is 2.3697×10^{24} atom/cm³ and Pu^{239} is 7.5893×10^{22} atom/cm³ in 70 year of the burn up period. Maximum power density is about 288.7461 watt/cm³, peak power factor of 2.8351 (radial direction) and 2.8351 (axial direction).

Keywords: Burn up, atomic density, HTGR reactor, uranium, power density