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Abstract Collection

Akhmad Muktaf Haifani, Hadi Suntoko, Topan Setiadipura, and Widjojo A. Prakoso., *A Probabilistic Approach to Assess Sediment Ejecta Hazard for Nuclear Power Plant Siting: Insights from the Serpong Case Study*. Tri Dasa Mega, 27 (2), 77.

Liquefaction-induced sediment ejecta endanger the safety of nuclear power plant (NPP) sites, yet traditional indices like LPI and LSN ignore important underlying mechanisms. This paper introduces the Probabilistic Ejecta Potential Index Analysis (Prob_EPI), a physics-based alternative that takes into consideration pore pressure dynamics, interlayer effects, and hydraulic gradients. When normalized against a Hydro-Mechanical Boundary (HMB) and confirmed with six statistical measures, the 80% artesian gradient is found as the essential threshold. When applied to two boreholes (DH11 and DH17) at the proposed Serpong NPP site under 250-5000-year seismic scenarios, Prob_EPI increases with seismic strength and reveals vulnerable sand layers at depths of 5-22 m. The approach strengthens the basis for evaluating ejecta hazards and increases confidence in nuclear site selection.

Keywords: Probabilistic EPI, Liquefaction hazard, Sediment ejecta, Core pressure, Hydro-mechanical boundary, Nuclear site safety

Donny Nurmayady, Mita Konstantin, Khairul Handono, Arief Tris Yulianto, Erwin Nashrullah, Nurlaila, Devita Nitiamijaya, Jentik Meikayani, and Muhammad Zulham Kentji. *Thermal Hydraulic Performance Asymmetric Aero Foil Fin in Printed Circuit Heat Exchanger*, Tri Dasa Mega, 27 (2), 95.

Aligning with the development of an advanced reactor in SMR design, a compact heat exchanger was considered important. Printed Circuit Heat Exchanger (PCHE) is a compact heat exchanger with the smallest dimensions among industrial heat exchangers. Many innovative designs have been published regarding thermal-hydraulic performance as well as architecture or structure in PCHE. This paper shows a comparison of airfoil fin shapes. The purpose of this study is to compare thermal hydraulic performance between symmetric and asymmetric airfoil fins in the Printed Circuit Heat Exchanger (PCHE) using three different gases, i.e., Nitrogen, Carbon dioxide, and Hydrogen. One row of 3-D airfoils has been analyzed with the Nusselt number, pressure drop, and heat transfer coefficient compared. The simulation has been done on the finite element method using COMSOL software to demonstrate the structures, the heat transfer profile, as well as thermal-hydraulic numbers. The asymmetrical aerofoil has about 23.38% higher heat transfer rate and 19.67% lower pressure drop compared to the Air Foil Fin (symmetrical aerofoil). It is concluded that an asymmetric aerofoil using carbon dioxide would provide the smallest physical dimension, followed by the lowest pressure drop.

Keywords: printed circuit heat exchanger, aerofoil fin Carbon dioxide, thermal hydraulic, pressure drop, heat transfer rate, Filling ratio, Natural circulation stability, LHP, Passive cooling system.

Putri Nur Cahyani, Mokhamad Tirono, Yohannes Sardjono, Isman Mulyadi Triatmoko, Gede Sutrisna, Fendinugroho, Nunung Nuraeni, and Heru Prasetio. *Boron Neutron Capture Therapy (BNCT) Dose Optimization for Oesophageal Cancer Using Particle and Heavy Ion Transport Code System (PHITS) Ver. 3.35*., Tri Dasa Mega, 27 (2), 105.

Esophageal cancer, which is a type of cancer that has a globally high incidence and mortality rate. Boron Neutron Capture Therapy (BNCT) is a promising radiation therapy method in esophageal cancer treatment due to its ability to deliver high doses selectively to tumor tissue with minimal impact on surrounding healthy tissue. This study aims to optimize BNCT dose distribution, evaluate the irradiation time, and determine the most effective irradiation direction in esophageal cancer. Simulations in this study were carried out using PHITS version 3.35 to model the geometry of esophageal cancer, surrounding organs, and radiation sources used. The phantom represented an ORNL adult male with a 24,69 cm2 tumor. The neutron source came from an accelerator with a 30 MeV proton beam. The boron concentrations analyzed in the cancer tissue were 110, 125, and 140 µg/g. Irradiation from the posterior (PA) direction with a boron concentration of 140 µg/g showed the most optimal BNCT therapy results, with an irradiation time *of 15.78 minutes. This technique is capable of delivering an effective dose to the cancerous tissue without exceeding the tolerance limits of the surrounding healthy organs, making it safe for use.*

Keywords: BNCT, PHITS, Dosimetry, Esophageal Cancer. Radiation Direction.

Al Fiyatuz Zuhroh, Mokhamad Tirono, Yohannes Sardjono, Gede Sutresna Wijaya, Isman Mulyadi Riatmoko, and Fendi Nugroho. *Boron Neutron Capture Therapy (BNCT) Dose Optimization for Varian Cancer Oligometastatic Using Particle and Heavy Ion Transport Code System (PHITS) v3.35*. Tri Dasa Mega, 27 (2), 117.

In Indonesia, ovarian cancer ranks third among cancer-related deaths, with a poor prognosis largely due to late-stage diagnosis and limited treatment efficacy. Boron Neutron Capture Therapy (BNCT) has emerged as a promising alternative, offering selective tumor cell destruction hrough boron-10–mediated nuclear reactions. This study employed HITS v3.35 to simulate BNCT in a case of oligometastatic ovarian cancer with para-aortic lymph node involvement (FIGO IIIC). The neutron source was a 30 MeV cyclotron. Simulations were conducted with two irradiation directions, posterior–anterior (PA) and left lateral LLAT), and three boron concentrations of 100, 120, and 145 µg/g. The A direction provided a more focused dose distribution to the tumor target nd a shorter irradiation time compared to LLAT. The results indicated that the posterior–anterior (PA) beam configuration provided a more favorable balance between tumor dose coverage, irradiation time, and organ-at-risk (OAR) sparing compared to the lateral approach. These findings suggest that PA irradiation with 120 µg/g boron concentration may represent a promising option in BNCT planning for ovarian cancer. However, as this work is based on simulation in an idealized phantom, further experimental and clinical validation is required before clinical application can be considered.

Keywords: BNCT, Dosimetry, Varian Cancer Oligometastases. PHITS

Ranji Gusman, Alexander Agung, Mohammad Subekti, Fitri Susanti, and Surian Pinem. *Validation of the Batan-3DIFF Code against Fission Chamber Measurements for In-Core Thermal Neutron Flux in the RSG-GAS Reactor*, Tri Dasa Mega, 27 (2), 131.

the accurate determination of neutron flux distribution is essential for reactor physics analysis and supports various applications, including material irradiation and radioisotope production. This study presents a comparative analysis of the axial thermal neutron flux distribution, evaluating results from the deterministic diffusion code Batan-3DIFF against experimental measurements obtained using a fission chamber detector. Measurements were performed at three irradiation positions—D-7, E-7, and G-7—within the RSG-GAS reactor core. At position D-7, the Batan-3DIFF calculation yielded a maximum thermal neutron flux of approximately 1.34×10^{14} $n\cdot cm^{-2}\cdot s^{-1}$*, while the fission chamber measurement recorded a slightly lower value of* 1.26×10^{14} $n\cdot cm^{-2}\cdot s^{-1}$*, corresponding to a relative deviation of 6.0%. Similar levels of discrepancy were observed at positions E-7 (6.7%) and G-7 (6.8%), with the computational results consistently overestimating the measured flux. The systematic deviations are primarily attributed to the geometric and material homogenization approximations inherent in the diffusion model, as well as differences in the neutron energy response of the fission chamber compared to the modeled spectrum. Despite these minor discrepancies, the overall agreement between the calculated and experimental flux profiles confirms that Batan-3DIFF is capable of reliably representing axial neutron flux distributions in the RSG-GAS reactor*

Keywords: Thermal neutron flux, Batan-3DIFF, Fission chamber, RSG-GAS reactor.

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