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# Abstract Collection

Tukiran Surbakti, Surian Pinem, Lily Suparlina., *Analysis of Reactivity Insertion as a Function of the RSG-GAS Fuel Burn-up.*, Tri Dasa Mega, 23 (1), 1.

*Analysis of the control rod insertion is important as it is closely related to reactor safety. Previously, the analysis has been carried out in RSG-GAS during static condition, not as a function of the fuel fraction. The RSG-GAS reactor in one cycle is a function of the fuel burn-up. It is necessary to analyze RSG-GAS core reactivity insertion as a function of the fuel burn-up to determine the behavior of the reactor, especially in uncontrolled operations such as continuous pulling of control rods. This analysis is carried out by the computer simulation method using WIMSD-5B and MTR-DYN codes, by observing power behavior as a function of time due to neutron chain reactions in the reactor core. Calculations are performed using point kinetics equation, and the feedback effect will be evaluated using static power coefficient and fuel burn-up function. Analyzes were performed for the core configuration of the core no. 99, by lifting the control rod or inserting positive reactivity to the core. The calculation results show that with the reactivity insertion of 0.5% Δk/k at start-up power of 1 W and 1 MW, safety limit is not exceeded either at the beginning, middle, or end of the cycle. The maximum temperature of the fuel is 135°C while the safety limit is 180°C. The margin from the safety limit is large, and therefore fuel damage is not possible when power excursion were to occur.*

*Keyword: Silicide fuel, Insetion reactivity, Fuel burn-up, MTR-DYN code, RSG-GAS core*

Santiko Tri Sulaksono, Sudjatmi Kustituantini Alfa, Dani Gustaman Syarif., *Critical Heat Flux Nanofluids Measurements System Using Arduino.*, Tri Dasa Mega, 23 (1), 9.

*Crtical heat flux (CHF) is an important characteristic of nanofluids. The CHF measurements were carried out in nanofluid research at the Center for Applied Nuclear Science and Technology. These measurements are done manually using a variable power supply and a multimeter. However, it was difficult to record the voltage and current due to the sudden break of the wire. In this study, Arduino was used to measure CHF automatically. The voltage is applied to the wire and increases automatically along with the measurement of the voltage and current in the wire. The results of the voltage and current measurements were compared with a multimeter and were not significantly different. It can be concluded that the CHF measurement system using arduino can be used to measure nanofluid CHF.*

*Keyword: Critical heat flux, Nanofluids, Arduino, Voltage, Current*

Iman Kuntoro, Surian Pinem, Tagor Malem Sembiring, Dwi Haryanto, Sigit Purwanto., *Evaluation of Equilibrium Core Operation of the RSG-GAS Reactor.*, Tri Dasa Mega, 23 (1), 15.

*The Indonesian Multipurpose Reactor, RSG-GAS reactor will accomplish its first lifetime in December 2020. The reactor has been operated in safe and reliable manner for about 33 years since it commenced in operation in 1987 to serve radioisotopes production, NAA, neutron beam experiments, material irradiation, and reactor physics experimental activities as well as training. The paper is intended to evaluate its in-core fuel management that is the conformance between the theory and implementation of the equilibrium core. Evaluation of the reactor operation parameter was carried out for core numbers 91 – 100. The data show that excess reactivity, shutdown reactivity and control rod reactivity have no significant difference at each core. The result shows that the BATAN-FUEL accurately determine the equilibrium core and its fuel loading pattern. This in-core fuel management of the RSG-GAS reactor supports the safety of reactor operation.*

*Keyword: RSG-GAS reactor, Reactor operation, Equilibrium core, BATAN-FUEL, In-core fuel management*

Mike Susmikanti, Roziq Himawan, Jos Budi Sulistyo, Farisy Yogatama Sulistyo., *Strain Analysis of Reactor Type Core Structures by Considering Uncertainties of Graphite's Properties.*, Tri Dasa Mega, 23 (1), 21.

*The power reactor with high-temperature gas-cooled reactor (HTGR) technology uses uranium as the reactor fuel. The energy from fission is converted to electrical energy or used for other needs such as hydrogen production or other research activities at high temperatures of around 700 $^{o}$C. This operation does not allow the use of metal as the core material for the reactor. The material that fits the requirements as a core structure is graphite. Graphite material has specific characteristics, namely the parameters of the modulus of elasticity, coefficient of thermal expansion, and the volume which changes due to temperature and neutron dose. Because the structure of the reactor core is a vital component in the reactor, this research will develop a method for the design of the reactor core structure with graphite material. The design method is based on "Design by Analysis" which specifically refers to the strain analysis on each of the reactor core components. The design method developed is based on the finite element method. The object of this research is the side reflector made from the Toyo Tanso IG-110 series graphite. Based on the analysis of heat distribution and heat stress for the material before the effect of neutron exposure, the temperature distribution on the side reflector was found, as well as the displacement and heat stress that occurs. isotropic properties, Young's modulus and Poisson's ratio values can be verified and estimated. The purpose of this research is to analyze the strain of the reactor core structure by taking into account the uncertainty of the graphite properties.*

*Keyword: Strain Analysis, HTGR, Graphite IG-110, Probabilistic Analysis*

Hafiz Fahrurrozi1, Andang Widi Harto, Isman Mulyadi Triatmoko, Gede Sutrisna Wijaya, Yohannes Sardjono., *Dose Optimization on Liver Cancer Proton Therapy and Boron Neutron Capture Therapy Using Particle and Heavy Ions Transport Code Syste.*, Tri Dasa Mega, 23 (1), 33.

*Liver cancer was the third leading cause of death from cancer in 2020 with 830,180 deaths worldwide. Radiotherapy is a common treatment method for liver cancer. Technological advances presented proton therapy and boron neutron capture therapy (BNCT) as alternatives with a lower dose on healthy organs. The objective of this research is to get a good dose distribution with higher tumor dose and lower healthy organ dose in proton therapy. A comparison with BNCT is done to get a better understanding of how both methods deliver the dose to treat the cancer while minimizing healthy organ doses. The research simulated proton therapy for cancer liver with Particle and Heavy Ions Transport Code System (PHITS), and a literature review for BNCT. The effectiveness of both methods were compared by tumor dose and liver dose. The optimal tumor dose for proton therapy is 86.01 Gy (W) with 0.67 Gy (W) liver dose. Proton therapy can replace conventional radiotherapy for tumors with complex shapes in dose delivery by utilizing its dose profile, while BNCT can give better tumor control on patients previously treated with conventional radiotherapy.*

*Keyword: Liver Cancer, Proton Therapy, BNCT, Dose Optimization, PHITS*

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# Keywords Index


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