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# Abstract Collection

Muhammad Darwis Isnaini, Elfrida Saragi, Veronica Indriati Sri Wardhani, *Prediction of AP1000's Nuclear Reactor Pressure Vessel Temperature During Normal Operation.*, Tri Dasa Mega, 24 (3), 99.

*Modeling of thermal-hydraulic calculations for the AP1000 core to predict the reactor pressure vessel (RPV) temperature has been carried out. The reactor's primary coolant system transfers the heat produced in the reactor fuel during reactor operation to the steam generator. Part of the heat will also be transferred from the coolant to the reactor vessel and the pipe. This paper presents the calculation result of the RPV temperature prediction during AP1000 normal operation. Calculations were performed using COBRA-EN code for analyzing the core thermal hydraulics and using analytics for predicting the RPV temperature. These methods were carried out with the aim to predict the RPV temperature as well as at steady state nominal power conditions, at the function of flow, and at power fluctuation conditions. The calculation results at nominal power 3400 MWt (100% heat generated in fuel was assumed) and thermal design flow with 10% tube plugging (TDF2) of 48,443.7 ton/hr, for the minimum system pressure of 15.1 MPa, nominal system pressure of 15.513 MPa, and design system pressure of 17.133 MPa, show that the core outlet coolant temperature is 326.96°C, 327.01°C, and 327.22°C, and the RPV temperature is 303.65°C, 303.87°C, and 306.67°C, and the minimum departure from nucleate boiling ratio (MDNBR) is 3.21, 3.29, and 3.01, respectively. During reactor operation at a fixed nominal power of 3400 MWt, nominal system pressure, and under the condition of flow fluctuation, the maximum RPV temperature is shown to be 303.87°C.*

*Keywords: Core coolant, Temperature, Reactor pressure vessel, AP1000, COBRA-EN.*

Luqman Satria Pradana, Utari, Suharyana, Azizul Khakim., *Estimation of Neutron and Prompt Photon Dose Rate Distribution in TMSR-500 Using MCNP6.*, Tri Dasa Mega, 24 (3), 107.

*Thorium Molten Salt Reactor-500 (TMSR-500), one of the Generation IV nuclear reactors, is designed by Thorcon International, Pte. Ltd, which is projected to be built in Indonesia. The reactor core is radially surrounded by B4C shielding, but not the upper part. As the silo hall sits above the reactor core and is accessible by reactor personnel, the dose rate must be calculated in the area to ensure the workers receive an annual dose below the acceptable limit. The dose rate from neutrons and photons as the result of fission reactions are the only sources to be calculated in this research, without taking the source from fission products into account. This research aims to obtain the dose rate distribution of neutrons and prompt photons using Monte Carlo code MCNP6. The reactor was assumed to operate at a nominal thermal power of 557 MWth. Dose rate calculation was obtained from flux Tally F4 and converted into dose rate using Dose Energy Dose Function (DEDF) factor. Conversion factors of flux to the dose were based on ICRP-21 and ANSI/ANS-6.1.1 1977. The result of the calculations showed that the distribution of neutron and prompt photon fluxes does not reach the silo hall.*

*Keywords: Neutron and Prompt Photon, Dose Rate, Distribution. MCNP6, TMSR-500.*

Santo Paulus Rajagukguk, Syaiful Bakhri, Ana Muliyana, Juniastel Rajagukguk., *Neutronic Analysis of the VVER-1200 Lattice cell fuel using WIMSD-5B Code.*, Tri Dasa Mega, 24 (3), 117.

*The calculation of safety parameters in nuclear reactors has an important influence on nuclear reactor control and safety. The infinite multiplication factor, reactivity coefficients, and power peaking factor parameters are the most important safety parameters for determining reactor status. The aim of the present study is to analyze the behavior of the nuclear safety parameters for the VVER-1200 core in a normal state of reactor operation. A lattice cell fuel model of the VVER-1200 reactor core was performed using WIMSD-5B. The cross-section library data based on the ENDF/B-VIII.0 was used. The investigated parameters were the value of infinite multiplication factor with different pitch, temperature, enrichment, and boron concentration. The calculation also investigated the reactivity coefficient parameters. The verification of WIMS model VVER-1200 was performed by comparing the results of the WIMSD-5B code with VVER-1200 data in the SAR document, and it was implied that they are in good agreement. The*

*calculated values of reactivity coefficients illustrated a safe behavior.*

*Keywords: Neutronic analysis, Safety parameters, VVER-1200, WIMSD-5 code, Lattice cell.*

Santiko Tri Sulaksono, Putu Sukmabuana, Nanda Nagara., *Microcontroller ATMega328P Timer/Counter for Single Channel Gamma Spectroscopy.*, Tri Dasa Mega, 24 (3), 125.

*Soil contamination may occur in the upcoming decommissioning activities of the TRIGA2000 Reactor. Measurement of contaminant radioactivity, which can be performed using single-channel spectroscopy, is required in soil decontamination processes. This research develops a timer/counter system for single-channel spectroscopy using a microcontroller. The performance of the ATMega328P microcontroller Timer/Counter on Arduino has been tested for single-channel spectroscopy. Microcontroller's Timer/Counter1 is used as a counter while Timer/Counter2 is used as a timer. Tests include the linearity test, comparative test, and chi-square test. The test results show that the ATMega328P microcontroller Timer/Counter works well and can be used as the end of a single-channel spectroscopic system.*

*Keywords: Timer, Counter, ATMega328P, Arduino, Single Channel Spectroscopy.*

Ihda Husnayani, Muzakkiy Putra Muhammad Akhir., *Collision Cascade and Primary Radiation Damage in Silicon Carbide: A Molecular Dynamics Study.*, Tri Dasa Mega, 24 (3), 131.

*Silicon carbide (SiC) is a competitive candidate material to be used in several advanced and Generation-IV nuclear reactor designs as a neutron moderator, fuel coating, cladding, or core structural material. Many studies have been performed to investigate the durability of SiC in a severe environment in a nuclear reactor. However, the nature and behavior of defects induced by neutron irradiation are still not fully understood. This paper is aimed to study collision cascade and primary radiation damage in SiC using molecular dynamics simulation. The potential being used was a hybrid Tersoff potential modified with Ziegler-Biersack-Littmark (ZBL) screening function. The collision cascade was let evolved for 10 ps from a Si or C primary knocked atom (PKA) located initially at the top center of a system containing 960.000 atoms. The simulation was carried out at room temperature as well as at several advanced fission reactor-relevant temperatures. It was obtained that the number of C point defects was larger than the number of Si point defects. The number of stable point defects was found to be temperature-dependent. It was also obtained that the recovery of point defects was larger at high temperatures (>800°C). This recovery behavior shows that SiC is suitable to be used at high-temperature conditions.*

*Keywords: Silicon carbide, Collision cascade, Radiation damage, Molecular dynamics Neutron irradiation.*

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