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Abstract Collection

Jupiter Sitorus Pane, Pande Made Udiyani1, Muhammad Budi Setiawan, Surip Widodo1, I Putu Susila., *Preliminary Development of Radionuclides Release of Individual Dose Code Program for Radiation Monitoring Purposes.*, Tri Dasa Mega, 23 (3), 91.

Environmental radiation monitoring is one of the important efforts in protecting society and the environment from radiation hazards, both natural and artificial. The presence of three nuclear research reactors and plans to build a nuclear power plant reactor prompted Indonesia to prepare a radiation monitoring system for safety and security (SPRKK). The goal of the study is to provide an appropriate method for developing radiation monitoring system to support the development of nuclear power plant in the near future. For this preliminary study, the author developed a code program using Gaussian distribution model approach for predicting radionuclide release and individual dose acceptancy by human being within 16 wind directions sectors and up to 50 km distance. The model includes estimation of source term from the nuclear installation, release of radionuclides source into air following Gaussian diffusion model, some of the release deposit to the land and entering human being through inhalation, direct external exposure, and resuspension, and predicted its accepted individual dose. This model has been widely used in various code program such as SimPact and PC-Cosyma. For this study, the model will be validated using SimPact program . The model has been successfully developed with less than 5% deviation. Further study will be done by evaluating the model with real measuring data from research reactor installation and prepare for interfacing with real time radiation data acquisition and monitoring as part of radiation monitoring system during normal and accident condition.

Keyword: Radiation release, Diffusion, Monitoring, Protecting

Yoyok Dwi Setyo Pambudi., *Classification of Nuclear Reactor Severe Accidents using Probabilistic Neural Network based on Particle Swarm Optimization.*, Tri Dasa Mega, 23 (3), 99.

Due to its exposure to hazard and complexity, the identification and prediction of severe accident scenarios against an initiating event of a nuclear power plant remain a challenging task. This paper aims to classify severe accidents at the Advanced Power Reactor 1400MWe (APR1400), which include the loss of coolant accident (LOCA), total loss of feedwater (TLOFW), steam generator tube rupture (SGTR), and station blackout (SBO) using a standard Probabilistic Neural Network (PNN) and Particle Swarm Optimization-based Probabilistic Neural Network (PSO PNN). The algorithm has been implemented in MATLAB. The experiment results showed that supervised PNN PSO could classify severe accident of nuclear power plant by 19.4-point percent better than the standard PNN.

Keyword: Probabilistic neural network, Particle Swarm Optimization, Severe accident, Nuclear reactor

Endiah Puji Hastuti, Iman Kuntoro, Suwoto, Syarip, Prasetyo Basuki, Tukiran Surbakti, Geni Rina Sunaryo, Sudarmono., *Map of Radioisotope Production and BATAN Research Reactor Utilization.*, Tri Dasa Mega, 23 (3), 105.

One of the National Research Programs (PRN) in the Currently, Indonesia through BATAN is operating three research reactors, namely the multipurpose research reactor GA Siwabessy (RSG-GAS) with the power of 30 MWt at Puspiptek south Tangerang (the first criticality was in 1987), the TRIGA 2000 reactor with the power of 2 MW in Bandung which the first criticality in 1965 with the power of 250 kW, was increased to 1 MW in 1971, and further upgraded to 2 MW in 2000. Beside that, there is Kartini reactor with a power of 100 kW located in Yogyakarta (first criticality in 1979). These reactors are quite old, and in accordance with Bapeten regulations, have carried out the first periodic safety review, to obtain a reactor license for the next 10 years of operation. In line with this, one of BATAN's current national research programs is to increase the production of radioisotopes and radiopharmaceuticals, where reactors play a very important role in the production of certain isotopes. In tracing the data obtained from operational reports related to irradiation

requests from reactor users, namely PTRR, PSTNT, and PT INUKI for radioisotope production, which has been carried out in the last 5 years, May 2015 until 25 August 2020, show that the irradiation request at RSG-GAS is still not optimal. In term of the utilization of RSG-GAS, it can still be optimized, which in this case needs to be balanced with post-irradiation processing capabilities. Meanwhile, from the results of tracing and data collection, it can be shown that at this time the reactors are still operating. The utilization activities of the reactors complement each other according to their age and facilities.

Keyword: Utilization map, Research reactor, Tracing and data collection, Radioisotope, National research program

Mukhsinun Hadi Kusuma, Anhar Riza Antariksawan, Giarno, Dedy Haryanto, Surip Widodo., *Study on Thermal Characteristics of U-Shaped Heat Pipe.*, Tri Dasa Mega, 23 (3), 115.

The latest accident in Japan's nuclear power station became a valuable experience to start engaging passive cooling systems (PCS) more aggressively to improve safety aspects in nuclear power reactors being studied in Indonesia. This investigation is related to the U-shaped heat pipe (UHP) research as PCS of water in the cooling tank (CT). The objective of this research is to study the thermal characteristics of UHP as PCS in the CT. The experiment on small-scale UHP and simulation with RELAP5 code has been conducted to understand the performance of UHP. The experiment results of the small-scale UHP model will be used as a basic understanding of simulating and designing a UHP with big scaling. The study result showed the highest thermal performance of UHP was obtained when it operated on the higher temperature of heat load and higher air cooling velocity. The more UHPs inserted into the cooling pool, the more heat that can be discharged into the environment. This result also shows promising use of UHP for CT PCS. The use of UHP as PCS can enhance the safety aspect of the nuclear reactor, especially in station blackout event.

Keyword: Nuclear reactor, Passive cooling system, Water in the cooling tank, U-shaped heat pipe, Experimental thermal characteristics, RELAP5

Pungky Ayu Artiani, Yuli Purwanto, Aisyah, Ratiko, Jaka Rachmadetin, Kuat Heriyanto., *Criticality Safety Analysis of the Dry Cask Design with Air Gaps for RDNK Spent Pebble Fuels Storage.*, Tri Dasa Mega, 23 (3), 123.

Reaktor Daya Non-Komersial (RDNK) with a 10 MW thermal power has been proposed as one of the technology options for the first nuclear power plant program in Indonesia. The reactor is a High Temperature Gas-Cooled Reactor-type with spherical fuel elements called pebbles. To support this program, it is necessary to prepare dry cask to safely store the spent pebble fuels that will be generated by the RDNK. The dry cask design has been proposed based on the Castor THTR/AVR but modified with air gaps to facilitate decay heat removal. The objective of this study is to evaluate criticality safety through keff value of the proposed dry cask design for the RDNK spent fuel. The keff values were calculated using MCNP5 program for the dry cask with 25, 50, 75, and 100% of canister capacity. The values were calculated for dry casks with and without air gaps in normal, submerged, tumbled, and both tumbled and submerged conditions. The results of calculated keff values for the dry cask with air gaps at 100% of canister capacity from the former to the latter conditions were 0.127, 0.539, 0.123, and 0.539, respectively. These keff values were smaller than the criticality threshold value of 0.95. Therefore, it can be concluded that the dry cask with air gaps design comply the criticality safety criteria in the aforementioned conditions.

Keyword: Dry Cask, Air Gaps, Criticality, Spent Fuel

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