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Research note

Investigation of reactivity variations of the Isfahan MNSR reactor due to variations in the thickness of the core top beryllium layer using WIMSD and MCNP codes

A Shirani[1] , L Ranjbar[1] and I Shahabi[2]

1. Department of Physics, Isfahan University of Technology (IUT),P.O.Box:84156-83111,Isfahan, Iran
E-mail: shirani@cc.iut.ac.ir
2. Research Center for Development of Reactors and Accelerators, Atomic Energy Organization of Iran,

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Abstract

In this work, the Isfahan Miniature Neutron Source Reactor (MNSR) is first simulated using the WIMSD code, and its fuel burn-up after 7 years of operation (when the reactor was revived by adding a 1.5 mm thick beryllium shim plate to the top of its core) and also after 14 years of operation (total operation time of the reactor) is calculated. The reactor is then simulated using the MCNP code, and its reactivity variation due to adding a 1.5 mm thick beryllium shim plate to the top of the reactor core, after 7 years of operation, is calculated. The results show good agreement with the available data collected at the revival time. Exess reactivity of the reactor at present time (after 14 years of operation and after 7 years of the the reactor revival time) is also determined both experimentally and by calculation, which show good agreement, and indicate that at the present time there is no need to add any further beryllium shim plate to the top of the reactor core. Furthermore, by adding more beryllium layers with various thicknesses to the top of the reactor core, in the input program of the MCNP program, reactivity value of these layers is calculated. From these results, one can predict the necessary beryllium thickness needed to reach a desired reactivity in the MNSR reactor.

Keywords: MNSR reactor, reactivity, fuel burn up, beryllium layers, MCNP code, WIMSD code

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