Proceedings of the Korean Nuclear Society Spring Meeting
Pohang, Korea, May 1999

A Study on the Signal Processing of the Sensitivity Depletion Laws for Rhodium Self-Powered Neutron Detectors (SPNDs)

Gil Gon Kim* and Nam Zin Cho
Korea Advanced Institute of Science and Technology
Department of Nuclear Engineering
373-1 Kusong-dong, Yusong-gu
Taejon, Korea 305-701

ABSTRACT

This work on the signal processing of the sensitivity depletion laws for rhodium self-powered neutron detectors (SPNDs) is performed to improve the uncertainty of the sensitivity depletion laws used in ABB-CE reactors employing rhodium SPND and to develop a calculational tool for providing the sensitivity depletion laws to interpret the signal of the newly designed rhodium SPND into the local neutron flux. The calculational tool for a time dependent neutron flux distribution in the rhodium emitter during depletion and for a time dependent beta escape probability that a beta generated in the emitter escapes into the collector was developed. These programs provide the sensitivity depletion laws and show the reduction of the uncertainty by about 1.0 % less than that of the method employed by ABB-CE in interpreting the signal into the local neutron flux. The reduction in the uncertainty by 1.0 % in interpreting the signal into the local neutron flux reduces the uncertainty by 1.0 % or more in interpreting the signal into the local power and lengthens the lifetime of the rhodium SPND by about 10.0 % or more.