

*Proceedings of the Korean Nuclear Society Autumn Meeting
Seoul, Korea, October 1998*

PIN POWER RECONSTRUCTION
FROM THE HANARO FUEL ASSEMBLY GAMMA SCANNING

Chul Gyo Seo*, Chang Je Park, Nam Zin Cho
Korea Advanced Institute of Science and Technology

Hark Rho Kim
Korea Atomic Energy Research Institute

Abstract

To determine the pin power distribution without disassembling, HANARO fuel assemblies were gamma-scanned using the tomography method and then the pin power distribution is reconstructed by using numerical methods. The gamma rays emitted in proportion to the pin power distribution are measured by a NaI(Tl) detector rotating an assembly at every 10 degrees. The pin power distribution $\mathbf{x}=\{x_1, x_2, \dots, x_m\}$ and the measured counts \mathbf{b} are related in a coupled set of equations as $\mathbf{Ax}=\mathbf{b}$. The elements in attenuation matrix \mathbf{A} , which give the possibility that a photon emitted from each pin will be detected by the detector, are calculated using the MCNP4B code.

The iterative least squares method (ILSM) and the wavelet singular value decomposition method (WSVD) are chosen to solve this problem. An optimal convergence criterion is used to stop the iteration algorithm to overcome the divergence in ILSM. WSVD gives a little better results and is more stable than ILSM. The averaged values from two methods give the best results. The results show that it is possible to reconstruct the pin power distribution from the assembly gamma scanning without disassembling.

*Present Address : Korea Atomic Energy Research Institute