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Correction of the Control Rod Cusping Effect  
Using One-Dimensional Fine Mesh Flux Profiles

Kibog Lee, Han Gyu Joo, Byung-Oh Cho, and Sung-Quun Zee  
Korea Atomic Energy Research Institute  
P.O. Box 150, Yusong, Taejon, 305-600, Korea

Abstract

The control rod cusping effect occurs when the heterogeneity within a partially rodded node (PRN) is not properly incorporated into the nodal calculation involving large, homogeneous nodes. In the present paper a new rod cusping correction method is proposed. This method uses fine mesh flux solutions obtained from two one-dimensional, three-node problems for each PRN. The heterogeneity within the PRN is explicitly kept and the flux-weighting factor is calculated from the resulting fine-mesh flux profile. The axial discontinuity factors are then generated with the homogenized cross section in the PRN for the subsequent nodal calculations. The result of this method corresponds with the reference result and the computation time spent in the rod cusping correction is less than 2% of the total neutronic calculation time.