

Feasibility Study to Enhance the Heat Transfer in a Typical Pressurized Water Reactor by Ribbed Spacer Grids

Authors : A. Ghadbane, M. N. Bouaziz, S. Hanini, B. Baggoura, M. Abbaci

Abstract : The spacer grids are used to fix the rods bundle in a nuclear reactor core also act as turbulence-enhancing devices to improve the heat transfer from the hot surfaces of the rods to the surrounding coolant stream. Therefore, the investigation of thermal-hydraulic characteristics inside the rod bundles is important for optima design and safety operation of a nuclear reactor power plant. This contribution presents a feasibility study to use the ribbed spacer grids as mixing devices. The present study evaluates the effects of different ribbed spacer grids configurations on flow pattern and heat transfer in the downstream of the mixing devices in a 2 x 2 rod bundle array. This is done by obtaining velocity and pressure fields, turbulent intensity and the heat transfer coefficient using a three-dimensional CFD analysis. Numerical calculations are performed by employing K-ε turbulent model. The computational results obtained are promising and the comparison with standard spacer grids shows a clear difference which required the experimental approach to validate.

Keywords : PWR fuel assembly, spacer grid, mixing vane, swirl flow, turbulent heat transfer, CFD

Conference Title : ICNTHS 2015 : International Conference on Nuclear Thermal Hydraulics and Safety

Conference Location : Madrid, Spain

Conference Dates : March 26-27, 2015