World Academy of Science, Engineering and Technology
International Journal of Computer and Systems Engineering
Vol:8, No:12, 2014

Structure of Turbulence Flow in the Wire-Wrappes Fuel Assemblies of BREST-OD-300

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Abstract : In this paper, experimental and numerical study of hydrodynamic characteristics of the air coolant flow in the test wire-wrapped assembly is presented. The test assembly has 37 rods, which are similar to the real fuel pins of the BREST-OD-300 fuel assemblies geometrically. Air open loop test facility installed at the “Nuclear Power Plants and Installations” department of BMSTU was used to obtain the experimental data. The obtaining altitudinal distribution of static pressure in the near-wall test assembly as well as velocity and temperature distribution of coolant flow in the test sections can give us some new knowledge about the mechanism of formation of the turbulence flow structure in the wire wrapped fuel assemblies. Numerical simulations of the turbulence flow has been accomplished using ANSYS Fluent 14.5. Different non-local turbulence models have been considered, such as standard and RNG k-e models and k-w SST model. Results of numerical simulations of the flow based on the considered turbulence models give the best agreement with the experimental data and help us to carry out strong analysis of flow characteristics.

Keywords : wire-spaces fuel assembly, turbulent flow structure, computation fluid dynamics
Conference Title : ICCFD 2014 : International Conference on Computational Fluid Dynamics
Conference Location : London, United Kingdom
Conference Dates : December 22-23, 2014