Study of Temperature Distribution in Coolant Channel of Nuclear Power with Fuel Cylinder Element Using Fluent Software

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Abstract : In this research, we have focused on numeral simulation of a fuel rod in order to examine distribution of heat temperature in components of fuel rod by Fluent software by providing steady state, single phase fluid flow, frequency heat flux in a fuel rod in nuclear reactor to numeral simulation. Results of examining different layers of a fuel rod consist of fuel layer, gap, pod, and fluid cooling flow, also examining thermal properties and fluids such as heat transition rate and pressure drop. The obtained results through analytical method and results of other sources have been compared and have appropriate correspondence. Results show that using heavy water as cooling fluid along with few layers of gas and pod have the ability of reducing the temperature from above 300 $^\circ$C to 70 $^\circ$C. This investigation is developable for any geometry and material used in the nuclear reactor.