

Neutronic Calculations for Central Test Loop in Heavy Water Research Reactor

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Abstract : One of the experimental facilities of the heavy water research reactor is the central test loop (C.T.L). It is located along the central axial line of the vessel, and therefore will highly affect the neutronic parameters of the reactor, so from the neutronics point of view, C.T.L is the most important facility. It is mainly designed for fuel testing, though other applications such as radioisotope production and neutron activation, can be imagined for it. All of the simulations were performed by MCNPX2.6. As a first step towards C.T.L analysis, the effect of D₂O-filled, H₂O-filled, and He-filled C.T.L on the effective multiplication factor (K_{eff}), have been evaluated. According to results, H₂O-filled C.T.L has a higher thermal neutron, while He-filled C.T.L includes more resonance neutrons. In the next step thermal and total axial neutron fluxes, were calculated and used as the comparison parameters. The core without C.T.L (C.T.L replaced by heavy water) is selected as the reference case, and the effect of all other cases is calculated according to that.

Keywords : heavy water reactor, neutronic calculations, central test loop, neutron activation

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