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The effect of tripartite fuel on the heat transfer quality and reactor safety in the case of pressurized water reactor

Abstract:

This seminar presents an improvement to the safety of operation, as well as the heat transfer efficiency in nuclear pressurized water reactor introducing the tripartite geometrical design of the fuel rods and hence, reviewing the influence on some of the aspects that might be effected during the reactor operation as well as the heat transfer in addition to the operation safety. Using a sub-channel analysis in three dimensional modeling, "ANSYS FLUENT" was used for processing the computational fluid dynamics calculations as well as modeling the geometries. The model shows how the geometry of fuel can improve the operation of a reactor and can change the efficiency of the heat transfer in the reactor which has a significant and direct effect on the power generation and later on the profitability accordingly. To show the effect of geometry, a certain geometry has been specified and suggested to present. The study focused on the highest possible operational power in the reactor mid-core where the "critical heat flux" (CHF) and "departure from nucleate boiling ratio" (DNBR) represent a significant considered factor.

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