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Participation

University of Missouri-Columbia Research Reactor (MURR) flux trap design using Fluent Computational Fluid Dynamics (CFD)

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The University of Missouri-Columbia Research Reactor Center (MURR) is the center of a world class, totally unique environment for the research, development, and production in major advances in nuclear medicine. The reactor operates at a ten megawatt power level. Samples are placed in three strategically positioned canisters situated in the flux trap zone of the nuclear reactor core. Heat is removed from the core by water flowing through it, as well as through the flux trap. The trap consists of three vertical cylinders 4 meters long which are encased inside one bigger cylinder, inside every cylinder there is one canister, where the samples are placed. Pool water at a high mass flow rate is pumped inside and around the cylinders to partially cool the reactor core (the main portion of the flow is directly through the core). The purpose of the research is to model the MURR using Fluent Computational Fluid Dynamics (CFD) software, to visually project the pool water flow and heat transfer in the flux trap to enable possible improved positioning of the irradiation samples. In other words, our focus is on being able to create a model of MURR, and understand the effects of geometry in the flux trap for the pool water flow to the fullest extent possible. In conclusion, the geometry of the MURR flux trap has been successfully modeled using GAMBIT, in addition water velocity, temperature, pressure and turbulence have also been successfully computed using FLUENT. The results show regions of high turbulence, strain and velocity in the flux trap. For Future work it will be useful to obtain functional data so these computer results can be verified, also the model that we have constructed should be improved to include all details of the reactor, and finally, the model should be further used to optimize the flow geometry and canister placement of the reactor.