Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Optimization of Pressurized Water Reactor Size and Coolant Flow Rate[1] SCOTT WAHLQUIST, Student, BRYAN LEWIS, Professor — In nuclear reactors, the heat generated in the system must be removed as fast as it is produced to operate in steady state. To accomplish this, liquid or gaseous coolant is moved through the core with pumps. In a typical pressurized water reactor (PWR), the standard inlet temperature is 290°C and the standard outlet temperature is 325°C. Using RANS modeling, a heat transfer CFD analysis was conducted on a basic structure of a PWR (neutron shield panel, nuclear core, and vessel wall) to show how water flows through the reactor and to determine the volumetric flow rate that creates the necessary convection to produce the inlet and outlet water temperature differential. The reactor was then scaled and the simulation was then repeated to observe the change in required flow rate. A plot comparing the size of the reactor to the required volumetric flow rate was made to determine the minimum and maximum reactors sizes with volumetric flow rates that don't exceed the max allowable flow rate of a typical PWR pump and still produces the outlet temperature.

[1]BYU-I Undergraduate Student Research Fund

Scott Wahlquist
None

Date submitted: 31 Jul 2019 Electronic form version 1.4