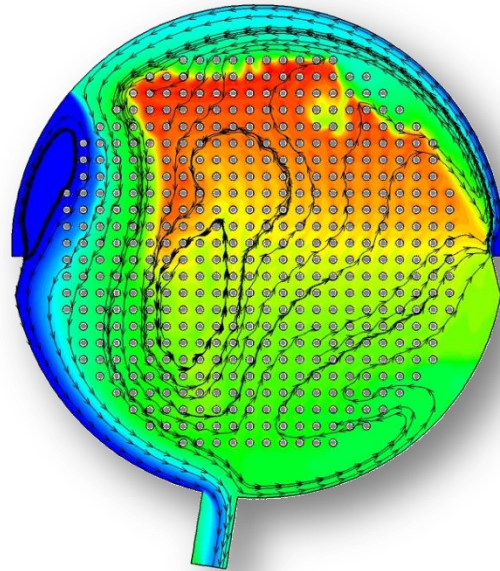
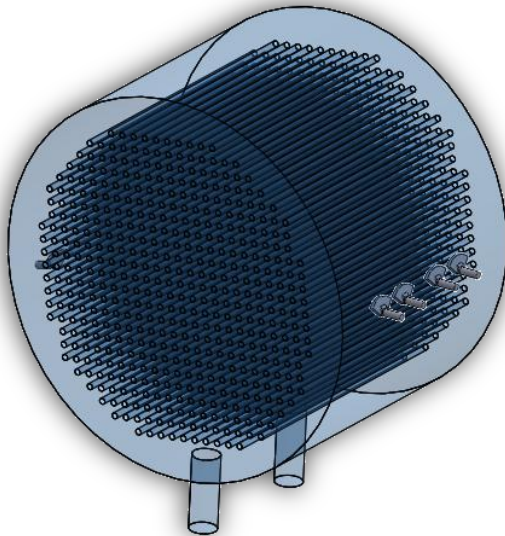


Investigation of Moderator Temperature Fluctuations in CANDU Reactor

In Canadian Deuterium Uranium (CANDU) nuclear reactor, heavy water is used both as the moderator and as the primary heat transport fluid. CANDU power reactor is comprised of hundreds of horizontal fuel channels in a large cylindrical Calandria vessel. The Calandria vessel contains cool low-pressure heavy-water moderator that surrounds each fuel channel.

In order to learn more on the velocity and temperature distribution inside CANDU reactor, a scaled Calandria vessel was designed. This CANDU Moderator Test Facility (MTF) is a $\frac{1}{4}$ scale of CANDU Calandria, with 480 heaters that simulate 480 fuel channels.

The major objective of this study was to determine the nature of the temperature fluctuations in the moderator. For this reason, a Computational Fluid Dynamics (CFD) analysis is conducted to better understand the interplay of velocity and temperature fields inside the moderator tank. Simulation of MTF tank showed how the alternating thermal plumes interact to cause oscillations in the velocity and temperature. Numerical simulations provide a more detailed description of the flow structures during the operation and identify potential issues.



The real time data recording at the various locations inside the MTF tank show fluctuations in the moderator temperatures.