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Heat Distribution Results from Experiments Using Array of 5 Sodium Heat Pipes

Heat pipes are self-contained two-phase passive cooling devices. Microreactor concepts configure heat pipes in parallel banks (arrays) to transport heat away from the core and into power generating working fluid. The array heat pipe experiment at the High Temperature Fuel Channel Laboratory (HTFC) of the Canadian Nuclear Laboratories (CNL) simulates such configuration using 12 electrically-heated channels to simulate the heat generated from the nuclear fuel and five cooling channels with heat pipes to remove the heat. The core is simulated as a stainless-steel block. Power output is measured using a gas-cooled stainless steel block at the opposite end of the heat pipe array. Of the five heat pipes, three can be turned-off by injecting a non-condensable gas into them. An initial experiment to benchmark the performance of the array heat pipe was conducted and used as a baseline to compare with the subsequent cases. Experiments were then conducted by selectively turning off heat pipes in the array. The results of these tests show the heat distribution differences when compared with the baseline, and the effect of heat pipe failure when used in an array configuration.

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