Fast Reactor Subassembly Design Modifications for Increasing Electricity Generation Efficiency

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Fast reactors are being considered as one element of future nuclear power systems to enable continued use and growth of nuclear power by limiting high-level waste generation. However, their higher cost relative to existing nuclear reactor designs, even with their higher thermal efficiency, results in higher electricity costs making them economically less attractive to
nuclear utilities. In an effort to increase thermal efficiency, fuel subassembly design changes are
being investigated using computational fluid dynamics simulations. The goal of this study is to evaluate the effects that subassembly hexcan design changes can have on subassembly coolant
flow, temperature distribution and hot channel factors. Simulations have been performed for a 19-
pin subassembly geometry using typical fuel pin diameters and wire wrap spacers. The results have shown that it should be possible to raise the average coolant outlet temperature without increasing peak temperatures within the subassembly, allowing for higher thermal efficiency.

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[1] http://www.cd-adapco.com/sites/default/files/Presentation/Nuclear%20Fast%20Reactor%20subassembly%20design.pdf