Thermo-mechanical Modeling of Pu-238 Production Target at HFIR

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Abstract

The production model in the COMSOL Multiphysics® software makes use of the most up-to-date PIE data, material property inputs, and modeling methodology. The fully coupled thermo-mechanical equations are solved over the entire domain, significantly increasing the degrees of freedom required for a solution, in addition to several other improvements in the computational methodology of the model. In addition, a significantly expanded solution space is covered using this model, given the updated inputs, including each of the seven target holder pins in position VXF-15 and pin 1 in VXF-3, as well as 10 discrete time steps for each of all 3 cycles of irradiation. This detailed solution space makes use of parametric sweeps and allows the verification of "pin 1" at the irradiation end of cycles to be the limiting safety cases for the production target.