A STUDY OF DIFFERENT HTTR FUEL COLUMNS LOADING SCHEMES

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High temperature engineering test reactor (HTTR), one of generation IV reactors, is a promising technology for electricity production and heat supply for high temperature industries such as hydrogen production and coal gasification since it has a maximum outlet temperature of 950°C [1].

During the initial criticality problem of HTTR benchmark problems, the number of fuel columns for the first criticality has been evaluated with fuel columns loaded clockwise from the outer region into the inner region [2], while in actual loading the core is symmetrically loaded to provide a symmetrical flux and power distribution, three scenarios of possible of different annular core loading has been studied. The annular cores are thin annular core, thick annular core, and fully loaded core, which represents 18, 24, and 30 fuel columns cores, respectively. We used the HTTR benchmark model from IAEA-TECDOC-1382 [2] with homogenized fuel compact simplification and MCU-PTR code with contentious fuel energy spectrum. The change of effective multiplication factor at different fuel loading schemes presented in fig. 1.

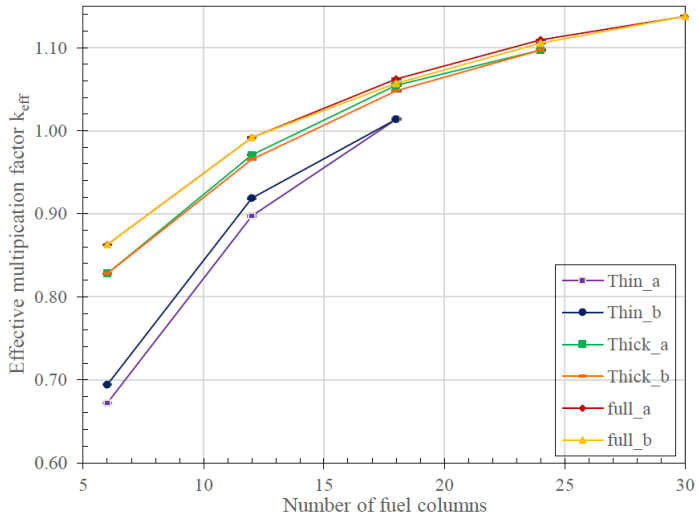

Fig. 1. Change of effective multiplication factor at the symmetric fuel loading approach to the first criticality for different fuel loading schemes

Accordingly, it's preferable to start the loading from the outer region into the inner region as such a loading scheme has the lowest rate of increment of reactivity to prevent higher values of the multiplication factor during the start-up, which could result into an uncontrollable state of the reactor core.

REFERENCES

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