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P4.176 Thermal analysis of a cryogenic distillation column for H2 isotopes separation

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Cryogenic distillation (CD) of hydrogen in combination with Liquid Phase Catalytic Exchange (LPCE) or Combined Electrolytic Catalytic Exchange (CECE) process is used for tritium removal/recovery from tritiated water both for ITER/DEMO and for fission rectors like CANDU.
Tritiated water is being obtained after long time operation of CANDU reactors, or in case of ITER mainly by the Detritiation System (DS).
The ICSI cryogenic system consists of four distillation columns and significant effort is required in various batch mode operations for achieving high tritium concentration.
Some problems have been experienced with the forth column of the cascade regarding the heat transient transfer during start-up. This paper intent is to present a CAE thermal simulation of the column during the transitory thermal regime in order to investigate the temperature distribution along the column and its connections to other equipment. The simulation is done on the as-built design of the column and takes in consideration the actual configuration. This work provides an important platform to understand the thermal phenomena during cool down of a cryogenic distillation column besides finding the failures in thermal insulation or design flaws. The results of the simulation can be used as lessons-learned for future design work of cryogenic systems like Tritium Removal Facility from NPP Cernavoda or ITER/DEMO ISS.

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