

THERMO-HYDRAULIC ANALYSIS ON KOREAN HCSB TBM WITH UPDATED BACK MANIFOLDS DESIGN

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While sound progress has been made on the design of Korean Helium Cooled Solid Breeder (HCSB) Test Blanket Module (TBM) towards achieving the objectives to verify DEMO relevant breeding blanket concepts in ITER, it is still challenging to satisfy all the design requirements due to its narrow margins with the extreme conditions. Especially, surface heat flux from plasma and volumetric heat generation by neutron wall loading are so severe, hence it is important to investigate that the thermo-hydraulic requirements for each component in the TBM are met by proper cooling scheme with the high pressure helium coolant of 8 MPa.

This paper presents thermo-hydraulic analysis results on the Korean HCSB TBM with the updated design. In the previous study done by the authors, the computation was performed on the TBM model with the assumption that the coolant is uniformly distributed at the back manifolds, without including the back manifolds in computational model. In the present study, the updated configuration of the back manifolds is introduced, and flow uniformity and cooling capability in each manifold are investigated. Then the whole TBM is modeled including the updated back manifolds. The thermo-hydraulic calculation on the whole TBM model is performed with conjugate heat transfer analysis between fluid and structure. It is found that the current back manifolds are reasonably designed so that the TBM components are effectively cooled against the associated thermal loads.