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P4.148 DEMO Breeding Blanket temperature evaluation before remote maintenance operation

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In DEMO the Breeding Blanket (BB) segments shall be periodically replaced, at end of life or after failure. Any replacement of a BB segment shall be performed by Remote Handling Equipment (RHE) through the vertical upper port: any active action is executed by RHE that clamps a BB segment in the upper portion using a BB transporter. A driving requirement of DEMO commercial technology for RHE is its maximum operating temperature at the BB-RHE interface during BB replacement: the objective of this study is properly to assess this limit, being now the allowable value at 100°C. This study deals with the Helium Cooled Pebble Bed (HCPB) concept.

The initial configuration is considered i.e. with all the BB segments sector (three outboard and two inboard segments) in place, and with some simplifications, the Finite Element model tries to predict if a cooling air flux in natural convection conditions inside vacuum vessel is adequate or if a cooling air flux with forced convection conditions must be adopted. The decay heat produced by the main blanket components (the BB modules caps and lateral walls, the backwalls, the supporting structures, the backplate manifolds, and so on) have been evaluated beforehand: the values applied as body loads in the thermal analyses have been selected within the set related to one month after shut-down. The resulting temperature distribution in the BB segments shows that a forced convection will be necessary. The obtained results, the analysis assumption and future analysis plan have been briefly discussed.

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