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Conceptual design of the torus cryopump for CFETR

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A torus exhaust pumping system comprising 6 identical cryosorption pumps for China Fusion Engineering Test Reactor (CFETR) is designed to provide specified pressure levels and throughputs for various plasma operation modes. A conceptual structural design is performed and recommendations are presented in accordance with the design requirements. Based on the analysis of conductance, the effective pumping speed is calculated and the influencing factors are discussed. The thermal loads of cryopanels and shields are then calculated to verify the feasibility of the concept and determine the consumption of coolants at steady-state operation. The temperature distribution of the cryopanels is displayed by a 3D thermal-hydraulic calculation and regarded as one of the boundary conditions to obtain the stress distribution of the cryopanels. Simulation results indicate that the temperature distribution and the maximum stress meet the design requirements proposed by the cryogenic properties of the gases pumped. Finally, the configuration and operation scheme of the torus cryopumps are given in accordance with the overall pumping characteristics. The conceptual design of the torus cryopump provides methods and experience for the overall design of CFETR in the future.

Eligible for student paper award?

No

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