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Conceptual Design of the Cryogenic System for the HL-2M System

Medium-sized tokamak HL-2A has been operated for nearly ten years. In order to increase plasma parameters and extend experimental research space under the condition of higher power auxiliary heating, the HL-2A tokamak has been approved to be modified into HL-2M as the second step for HL-2A project. Cooling power of 300 W at 4.5 K is required to maintain operation of the cryogenic system of HL-2M. The cryogenic system used to cool the toroidal cryopump, neutral beam cryopump and other small superconducting magnets. To cope with different operation schedule, the cryogenic system has several operation modes, which are cool-down mode, warm up mode, two-phase helium cooling mode and cryopump regeneration mode. Considering the long-term planning, this cryogenic system which has some additional interfaces can also work under forced flow cooling mode. This paper describes the conceptual design of this cryogenic system, which includes the design of the flow scheme, the estimation of the heat load, the thermodynamic analysis of the system and the design of the operation modes.

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