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Research and Analysis on the Compatible Structures of the CFETR Divertor Based on the Remote Handling Requirements

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Abstract: The Chinese Fusion Engineering Test Reactor (CFETR) is the next device in the roadmap for the realization of fusion energy in China, which aims to bridge the gaps between the fusion experimental reactor ITER and the demonstration reactor (DEMO). As a key in-vessel component in tokamak fusion reactor, the divertor which eliminates impurities, Helium ashes and heat flux often exposes to tritium environment and neutron radiation. Therefore, the divertor is very easily damaged, and it needs to be maintained regularly. Its maintenance should be handled by remote handling (RH) ways rather than by personnel directly, so the structures for remote handling ways should be suitable and feasible. It not only can meet the requirements for the RH but also should have adequate strength to resist high electromagnetic forces generated by Eddy current and Halo current due to the plasma disruptions. In this paper, the CFETR RH compatible structures are analyzed and two schemes are put forward based on the RH requirements. Then their working conditions, especially electromagnetic analysis are discussed to validate the design quality for the newly designed structures. After that, the maintenance processes of two schemes are simulated in the virtual environment by the software Delmia. Through simulation, the installation and dismantlement processes of the divertor can be vividly seen in Delmia where can check whether there will be interferences between the divertor and other components. What's more, the distribution of other components and the location of RH ports can be determined by simulation. And the maintenance procedures of the divertor are planned rationally according to the simulation PERT chart. Finally, the optimal path for the divertor RH process is chosen through simulation.

Eligible for student paper award?

Yes

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