ON DESIGN AND DEVELOPMENT OF ADDITIONAL END-EFFECTORS FOR THE CASSETTE MULTIFUNCTIONAL MOVER

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The Divertor Cassettes need to be replaced three times during the estimated 20 years of operation of the ITER. The vacuum vessel contains 54 Cassettes, each of them are installed/ replaced through three remote handling ports. Cassette Multifunctional Mover (CMM) and Cassette Toroidal Mover (CTM) are used in the Cassette Remote Handling (RH). CMM is equipped with additional tooling to allow for handling different types of Cassettes and the CTM. Additional tooling for CMM consists of Central, Second and Standard Cassette End-Effectors (EE).

In this paper we discuss the design and development process for the RH equipment to be used in the ITER environment. Design concepts for the Standard Cassette End-Effector (StCEE) and Central Cassette End-Effector (CCEE) are described and the methodology for the conceptual design phase will be presented. The conceptual design aims to fulfil a set of requirements imposed by the demanding ITER operating environment. Requirements include, among others, functional and non-functional requirements.

To gain an insight of the target plant and to establish clear boundary conditions for the design process extensive virtual reality simulations were concluded prior to the concept development phase. The verification of the structural integrity of the different concept designs is achieved by the means of FEA (Finite Element analysis). During the concept design phase different modifications to the designs are traced back with the help of traceability matrices.

Design process consisted of designing the mechanical construction and defining and developing the operational sequences for both End-Effectors. Operational sequence for the CCEE includes the transportation of the Central Cassette (CC) to the Vacuum Vessel (VV), applying required preloading force and locking the CC into the reactor. The sequence for the StCEE includes the methods for transportation of the Standard Cassette or CTM to the VV and locking the Dummy Rail into the reactor.

The main improvements of the new proposed EE concept designs are more robust and reliable assembly process with reduced CMM mover assembly accuracy requirement, and significantly reduced contact pressures at the Divertor Support Pads. The chosen design concepts are verified with virtual reality simulations and are fulfilling the requirements of the concept design phase, including; structural, assembly sequence, safety and reliability requirements. The finalized design concepts for the StCEE and CCEE are presented in this paper. The design concepts will be used as a basis for the procurement, detailed design and prototyping phase at the Divertor Test Platform 2.