CASK AND PLUG HANDLING SYSTEM DESIGN IN PORT CELL

Jean-Pierre Martins[1], Jean-Pierre Friconneau[1], Eros Gabellini[3], Delphine Keller[2], Bruno Levesy[1], Anna Selvi[3], Alessandro Tesini[1], Yuri Utin[1], Julien Wagrez[2]

[1] *ITER Organization, CS 90 046, 13067 St Paul lez Durance Cedex, France*
[2] *Association Euratom-CEA sur la Fusion Contrôlée, Centre d'Etudes de Cadarache, F-13108 SAINT-PAUL-LEZ-DURANCE CEDEX, France*
[3] *SAMTECH Italia, Via G. Rasori, 13, I-20145 Milano, ITALY*

Corresponding author: jean-pierre.martins@iter.org

The ITER maintenance strategy relies partly on the remote transfer of components from vacuum vessel to hot cells. This function will be fulfilled by transfer cask systems. These remotely controlled devices are composed of a sealed container and a 6 degrees of freedom alignment mechanism mounted on a air cushion based transport system. The alignment system is used to ensure correct docking of the cask with the vacuum vessel port.

One of the key phases of the transfer operation is the loading and unloading of vacuum vessel components into the cask container. This operation occurs in port cells, which are areas located behind the machine ports. The major configuration taken into account for the design and definition of interfaces is when the transfer cask system is parked in the port cells with its container docked to the vacuum vessel port. From this specific position, most of the characteristics of the handling system can be derived (maximum stroke of the mechanisms, maximum loads, alignment tolerance, space allocation ...).

The cask systems also perform handling of plug components. In-container tractors transfer components from the vacuum vessel port into the cask, and vice-versa. Recent design progress has been made which increases plug handling feasibility by implementing continuous guiding features which avoid cantilevered loads on the tractor. Also the design of the system has progressed in order to allow the docking of the casks at all levels.

A mechatronics finite element analysis of equatorial cask & plug remote handling system has been performed to assess the behaviour of the whole system. When the cask is connected to the port, it becomes part of the machine first confinement boundary, thus it must provide tightness continuity. This high level safety function was one of the main concerns of this FEA study. The computation process (methodology and results) has also contributed to help to improve the understanding of the whole system functions, interfaces and boundaries.

This paper will describe the overall progresses made on casks and plug handling system design in port cells. Numerical analysis methodology and results will be explained and shown in order to highlight how the numerical analysis has reinforced our knowledge of the system.

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Corresponding Author: Jean-Pierre Martins
jean-pierre.martins@iter.org
ITER Organization,
CS 90 046
13067, Saint Paul lez Durance, Cedex France
+33 (0)4 42 17 80 75