FEASIBILITY OF UPPER PORT PLUG TUBE HANDLING

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In the diagnostic Upper Port Plugs (UPPs) of ITER, several teams propose a removable tube as an on-vessel replaceable module. Tubes would allow more frequent maintenance than currently possible with UPP replacement or alleviate limited access conditions. Frequent maintenance is the only mitigation option left to guarantee a high availability of the system concerned to ITER operation. This paper develops and proposes new concepts for tube integration into the UPP design, and analyses the feasibility of tube handling.

Tube interfaces are to be designed for more frequent exchange than UPP interfaces. A critical point in the design is the mechanical mounting of the tube combined with design of the vacuum interface, structural mounting flange, and coolant & service connections. Another critical point is the removal of ex-vessel equipment in the Port Plug Interspace and the Port Cell. Considering that the time for hands-on access at the Plug flange is limited by worker radiological exposure, this must be minimized.

Avoiding cantilevered handling allows for a smaller footprint of the handling equipment, thus minimizing interference with port cell installations, and more design freedom on the tube's flange. An exploration of tooling concepts is presented, completed with an integrated approach for reliably gripping and mounting the tubes.

Using tubes has an impact on the Hot Cell operations as these are mainly serial in nature. For the on-vessel remote operations, tubes have less impact on the shutdown schedule, as these activities can to some extent be performed in parallel. The time horizon for acquisition of tube tooling is in the distant future. However, considering that the availability of the tooling is a system design input, the design impact is imminent.

The added value of the tube concept remains to be proven. Nevertheless, they provide in the need of diagnostic designers for more frequent replacement of critical components.