

## **DTP2 CONTROL ROOM OPERATOR AND REMOTE HANDLING OPERATION DESIGNER RESPONSIBILITIES AND INFORMATION AVAILABLE TO THEM**

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ITER divertor remote handling (RH) operations are demonstrated at the Divertor Test Platform 2 (DTP2), located in Tampere, Finland. Operation trials executed from the factory floor have triggered an urge to rethink the roles and responsibilities of the operators in the Control room. RH operations can be automated to some extent, however, all operations will be carried out in man-in-the-loop fashion due to safety reasons. Device operator is in important role especially during complex operations that require direct manual control. Since RH operations are long and complex they have to be planned and validated carefully beforehand by remote handling operation designers. These demands have affected the DTP2 control room layout and software sub-system design. Usability and flexibility of the Control room and its sub-systems is discussed in this paper. New solutions and propositions based on studies and experiences of the current system at the DTP2 and other similar systems are presented.

It is noted that in order to get the controllability sensation of the RH device operator has to also have full control over auxiliary systems, such as Visualization software. This results that operator multitasking has to be utilized during RH operations. Since there have been studies which prove that multitasking can be stressing to human and can cause cognitive overload, it is suggested that amount of sub-system information displayed to operator should be reduced to minimum. These sub-systems should also be available for the remote handling operation designers in the planning phase. However, designers need to have more information and functionality available than operators. For this reason, characteristics of both user groups are defined. This includes a discussion of what is relevant information during planning phase and what information should be hidden while executing the operations. It is presented that software design of the sub-systems shall utilize user modes.

In this paper, it is also discussed how to ensure that control room operators are dealing with correct data and models at all times. Previously all the devices at the DTP2 were tested separately and for example virtual models used were not the same. Now when devices should be handled simultaneously and common data is used, operators of different devices should not have access to changing for example virtual model or predefined and validated operation sequences. This information configuration management that DTP2 remote handling control system uses, should be under strict revision control and the changes should be traced during the lifecycle of RH operations. This practise would make designers responsible of having correct and validated information configuration and models available to operators. The operators could then concentrate only on executing the remote handling operations safely. Also storing this common information that every control system sub-system is required to use is discussed.