IWR-SOLUTION FOR OPERATIONS REQUIRED IN THE ASSEMBLY OF ITER

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The assembly of ITER is still one biggest challenge among the building ITER; some critical issues are still remained to be solved. The walls of ITER sectors are made of 60mm thick stainless steel and are joined together by high efficiency structural and leak tight welds. The processes of assembling mainly include a) *Preparing splice plate;* b) *Transfer of splice plates; c) Welding ; d)Port assembly; e) NDT testing and f)Machining and re-welding.*In addition to the initial vacuum vessel assembly, the sectors need later to be replaced for repair. And all the processes have to be carried out inside the vv. Because of the commercially available robots are too weak and large to be able to carry out the required machining operations and lifting of the possible e-beam gun column system, indeed, the conventional serial kinematic robots lack the stiffness and accuracy required in such machining conditions. To find the solution for the VV assembling, EFDA has lunched several tasks in developing a intersect welding robot (IWR) to carry out welding and machining inside vv in EU since 2000, and the Laboratory of intelligent machine in Lappeenrata university of technology has been involved in the tasks and developed two generations of special hybrid machine since then.



Fig.1 Two robot cooperation



Fig.2 Machining

This paper first gives analysis of the key issues in assembling of ITER, to fulfil the assembling task a mobile hybrid parallel mechanism machine is then introduced, The optimized assembling process curried out by IWR co-working with welding robot is given in paper shown in Fig.1 and Fig.2. The machining, welding and handing tests have been curried out in the laboratory of intelligent machine by cooperate with CEA in France, VTT in Finland and Ansaldo in Italy. The results have been given and analysed in the paper. In 2006 EFDA has evaluated different possible methods based on commercial serial robot, special machines and the IWR robot. In this evaluation the hybrid parallel robot IWR appeared to be the best solution.