EFDA GOAL ORIENTED TRAINING SCHEME

TASK AGREEMENT

WP2 Maintainability associated to ITER Component Lifecycle

Trainee Report
Reporting Period: June 2009 – December 2009

Entire Period of Research Training: June 2009 – June 2012

NAME OF TRAINEE:	**JULIEN WAGREZ**
EMPLOYING INSTITUTION / TA PARTNER:	**CEA**

TCS activity

1st deliverable to SAMTECH: Done

The CEA has contributed to several design and integration tasks in the region of the ITER equatorial ports. The Port Plugs remote handling equipments have been studied in details in order to support ITER IO in the definition of the interfaces between maintenance equipments (including procedure) and components design.

The CEA has provided to the SAMTECH company a model preparation engineering, in the frame of the activity related to the simulation of the Equatorial Cask and Plug Remote Handling System during docking operations for ITER IO ([1],[2],[3]). The CEA acts as a subcontractor by providing its expertise in order to help SAMTECH in the definition of the needed input data for the Transfer Cask System simulation.

The report summarizes the work done on the Transfer Cask System 3D models preparation in order to perform relevant Finite Element Analysis on the system. The different parts of the report are focusing on the initial model, geometry preparation, boundary conditions, loading conditions and kinematics of the mechanism.

Support for a mechatronics finite element analysis of the iter equatorial cask & plug remote handling system
Contribution to the specifications and CAD model description
SAMTECH Contract 430000000002 (IDM : 2VV6V6)
2009-09-30_CEA_JPM_JWZ_ITER_TCS_FEA *(ITER_D_2N8MAB v1.0)*

2nd deliverable to SAMTECH: 90%

This second report completes and finalizes the work previously done on the Transfer Cask System 3D models preparation in order to perform relevant Finite Element Analysis on the system. Different points are described:

- The TCS docking position has been redefined in more stringent configuration in order to simulate the most critical case : the pallet docking pins are positioned on the limit of the concrete floor of the port cell.
- The force that must be applied by the envelope on the sealing interface is determined through a calculation on the rubber gasket fore/compression abacus

An analysis of the misalignment configurations has been performed in order to define the most critical cases to be simulated. Two approaches have been followed:

- Direct kinematic: the worst positions are given by the maximums of the different actuators
- Inverse kinematic: the worst positions are given by the maximums of the port manufacturing tolerances

The dynamic behaviour of the cask during seismic events should be also assessed, thus additional information have been gathered :

- The inventory of the different seismic loading cases
- The TCS model inertias

TBM activity

TG04 T19
1st deliverable to F4E: 70%

Background
Before the removal of an irradiated TBM Port Plug (or after its re-installation), the disconnection (or reconnection) of the TBS pipes and instrumentation lines in the Vacuum Vessel Extension (in front of the bioshield) and in the Port Cell (behind the bioshield) requires the use of a remote handling system because of human access and/or space restrictions in these areas.
Preliminary design studies of a remote handling system have been performed for the HCLL and HCPB TBMs under past EFDA studies. Up to now, these studies have been performed independently for both concepts and, in the case of the HCPB, considering a horizontal TBM configuration.
The words "remote handling system" refer to the whole system including the robot arm, the supporting (movable) structure, the whole set of tools (cutting/welding/inspection/clamping), all ancillary removable or permanent equipment (e.g. thermal insulation, pipe alignment, gas stack, etc.) and all supply lines (electrical, water, pneumatic, etc.) up to the connectors (included) to the ITER Plant.

Objective
The objective of the task is to update the design studies of the remote handling system taking into account recent project specifications (e.g. change of orientation of the HCPB TBM, allocation of both HCLL and HCPB TBMs in the same Port Plug) and to provide further design details up to a level allowing:

- to confirm the feasibility (i.e. no killing issues) of a remote handled connection/disconnection of pipes and instrumentation lines and the localization of their interfaces;
- to define the interfaces with Port Cell equipment;
- to issue preliminary interface requests to ITER (storage space, loadings, supplies, etc.);
- to define technologies development need;
- to propose a qualification plan for functional sub-systems up to the entire remote handling system;

DATE:	01/02/2010
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