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REPLACEMENT OF A HEAVY MANIPULATOR IN A HOT CELL

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This program consisted of the following:
- Analysis of the existing heavy manipulator's dismantling,
- Functional analysis for a new heavy manipulator,
- Design of new manipulators,
- Manufacturing, testing and introduction of new heavy manipulators
This operation was conducted by the Commissariat à l'Energie Atomique (CEA), Marcoule center.

Summary

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1. Introduction : The existing heavy manipulator of the Cell is a semi gantry with a bracket and an arm. It moves from north to south on railways. It had more and more difficulties to move. The hot cell is only at half of its production objective (1700 fuel or dummy elements already done, the same has to be done). So in 2009 it was decided to change the existing HM. The arm (shoulder) of the heavy manipulator finally broke down in 2010.
2. Analysis of the existing heavy manipulator's dismantling The existing heavy manipulator is mechanically and electrically linked to the wall and to the rails of translation. It was introduced at the end of the cell building without providing possibilities for removal or remote intervention (except for the bracket and arm). It was decided to leave it in the middle of the hot cell temporarily. The hot cell is 14 meters long.
3. Functional analysis for new heavy manipulators Two zones were identified:
4. The bottom part with recurrent uses of the manipulator,
5. The top part with exceptional uses. It was decided to manufacture two heavy manipulators. Each manipulator using an existing arm adapted on a specific trolley was supposed to lift 200 Kg. The lower manipulator is permanently in the cell, uses the existing railways, has a parallelogram to reach the requested zone, can be removed from the cell for repair, is carried out from north to south of the existing heavy manipulator with the lifting unit. It is used for emergency exit of the top manipulator. The top manipulator is introduced in the cell on demand, is put on the crane frame and linked to the crane trolley (right or left). The motions are managed by the crane.

6. Design of new manipulators The new manipulators had to get in the hot cell from the maintenance cell through a square hatch of 1.5 meter large in order to get in for implementation and to get out for maintenance. Only the crane can access the implementation zone of the bottom manipulator. The put down of manipulator and plug in of power was done by the crane and the manipulator itself finished its establishment. It was linked to the railways by anti-tilting equipment to prevent a seismic hazard. The movements of manipulators are electrically motorized in order to limit oil in the cell (to prevent criticality hazard). Electrical power, instrumentation and control are the same for both manipulators.
7. Manufacturing, testing and introduction of new heavy manipulators The new manipulators had to be adapted to a rather undefined environment. The electrical distribution represented an important difficulty. The first implementation was done by the crane, then the manipulator was connected and prepared itself its zone (better implementation of the power supply, cleaning of the zone in order to put on the cable chain, put on the cable chain, ⋯). The top manipulator was supplied by a cable from the bottom of the cell.

The manufacturing of the new manipulators was carried out between January 2011 and March 2012. The new manipulators were set up from March to June 2012.

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