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COMPONENT HANDLING SYSTEM : PFBR AND BEYOND

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Component handling system deals with the handling of fresh and spent subassemblies (fuel handling) and irradiated primary system components using special flasks (special handling). In FBRs, design of fuel handling machines is very important considering the fact that in-vessel handling is a blind operation due to opacity of sodium and most of the fuel handling operations are carried out remotely. Special features are provided in the design of hoisting system of fuel handling machines like single failure proof design features in order to avoid fall of subassembly during handling. Incidents on component handling system have a serious impact on plant availability and hence utmost care is taken in the design to avoid wrong operations of fuel handling machines.

PFBR in-vessel handling utilises two rotatable plugs and an offset arm type machine (Transfer Arm). For ex-vessel handling, an A-frame type machine called Inclined fuel transfer machine (IFTM) is used. Several other machines are used as part of the fresh and spent fuel handling chain. A water pool type storage is provided for ex-vessel storage before the subassemblies are transferred to the reprocessing plant. Critical primary fuel handling machines namely Transfer arm and IFTM were qualified by cyclic testing in air and in sodium in dedicated test facilities. The design of PFBR fuel handling system and the design validation of the critical fuel handling machines are described in this paper.

The design, manufacturing and testing of fuel handling machines of PFBR have given valuable feedback for future FBRs. Beyond PFBR, six more oxide fuelled FBRs are planned as twin units. Refuelling in fast reactors being done off-line, gives opportunity to evolve a fuel handling system shared between multiple units for improved economy. The design of fuel handling system for the twin unit 600 MWe future FBRs is described. The rationale behind the changes proposed with respect to PFBR is brought out. Most of the fuel handling equipment is shared between the twin units and a unique twin unit layout has been evolved which is also covered in this paper.

In the future, it is planned to deploy metal fuelled based reactors for achieving faster growth through rapid deployment of FBRs. The details of fuel handling system conceived for future metal fuelled FBRs is also brought out.

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