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Testing and Qualification of shielded flasks for handling sodium wetted large sized components of PFBR

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BHAVINI is constructing Prototype Fast Breeder Reactor (PFBR), forerunner of FBRs, a 500 MWe sodium cooled, pool type, mixed oxide (MOX) fueled reactor at Kalpakkam. Presently PFBR is in the commissioning phase. The reactor has three main heat transport circuits namely primary sodium, secondary sodium and steam-water system. The Primary sodium Pump and Intermediate Heat exchanger housed inside the Reactor vessel needs to be handled for repairs / replacements during reactor life. Due to the activity of primary sodium, corrosion products or induced activity in these components and to avoid chemical reaction of Sodium with air and moisture, PI Flask (Pump and IHX Flask) is used for handling these components. PI Flask is a 35m tall and ID 2250mm leak tight structure to handle 60T load in a leak tight manner and shielded environment. The total weight of the PI flask along with Pump or IHX is weighing 200 MT which is handled with 280MT EOT crane installed in Reactor Containment Building. Constructional feature includes hoist mechanism to lift 60T load designed with single failure proof system, mechanical stoppers to support the load at 30m height, 12 leak tight shells with bolted construction meeting the verticality, horizontality and leak tightness requirements and disc valve drive mechanism integrated with Airlock to facilitate opening and closing of separable discs for the movement of Pump or IHX. All the materials used were tested to ensure specification requirements are met and the fabricated joints were subjected to NDE and HLT. The shielded shells were subjected to radiometric testing to ensure shielding requirements. The mechanical stopper mechanism, hoist mechanism and disc valve drive mechanism were independently tested before final assembly and Performance tests under 'No' load, 'Full' load and 'Over' load conditions including verification of interlocks were conducted for the qualification of PI Flask using mobile Control Panel. This paper presents the various performance tests conducted under 'No load' and 'full load' conditions for the qualification of leak tight requirements, shielding adequacy and functionality checks of various in built mechanisms viz., Hoist, Disc Valve and Mechanical Stoppers using PLC of PI Flask

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