

Retractable Finger Spent Fuel Handling Tool

Background

Recent operating experience has shown that the spent fuel handling tool can become misaligned and stuck on a spent fuel assembly while in the unlatched condition. It can become misaligned in such a way that one of the alignment S-pins enters the correct hole on the fuel assembly top nozzle while the other misses its hole, causing the tool head to rotate and its fingers to lodge under the fuel assembly top nozzle springs. In response to this occurrence, Westinghouse developed a new, patented design for a retractable finger spent fuel handling tool (RFSFHT) that prevents the tool from becoming stuck on a fuel assembly top nozzle while in the unlatched position.

Description

For the majority of pressurized water reactor (PWR) spent fuel handling tools, the gripper fingers remain at a fixed elevation and simply pivot between a latched and unlatched orientation. This places the gripper fingers at an elevation that can interfere with the top nozzle springs if not properly aligned. The RFSFHT incorporates fingers that both pivot and raise/lower with a single latching or unlatching operation. When in the disengaged position, the gripper fingers are raised and enclosed within the tool head housing, as illustrated in the unlatched position figure. This prevents the tool from becoming lodged onto a fuel assembly regardless of any misalignment during the latching process.

Operation of the RFSFHT is identical to current spent fuel handling tools in the industry so minimal updates are required to training and operating procedures. The tool is inherently fail-safe because the design requires the operator to raise the gripper fingers to unlatch – meaning it cannot be unlatched when a fuel assembly is suspended from the tool. The RFSFHT has passed testing in which this scenario was simulated to verify that an operator cannot unlatch a tool from an assembly while the tool is under load.



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Benefits

The RFSFHT design offers the following benefits:

- In the unlatched position, gripper fingers are housed within the body of the tool head to prevent any undesired interaction between gripper fingers and top nozzle springs, rod cluster control assemblies, thimble plugs, etc.
- It incorporates the latest tool design upgrades such as:
 - Captured and locked fasteners
 - Full-down indicator
 - Reduced tool head envelope for use in high density racks
 - Chamfered lead-ins for smooth and easier fuel rack entry
 - Single-piece latch pin design for foreign material exclusion
 - Spring assist for reduced operating effort
 - Reduced number of threaded joints
 - Optional two-piece design for ease of transportation
- It is designed for 14x14 and 17x17 PWR fuel types and can be easily modified for 15x15 and 16x16 PWR fuel.

Experience

RFSFHTs are currently used at multiple Westinghouse PWR plants and for training at our Waltz Mill Service Center in Madison, Pennsylvania (USA).

The RFSFHT is protected by U.S. and international patents.



Latched position

Unlatched position