

Rod Control Cluster Change Tool

Background

Through continuing efforts to optimize the refueling services window, and consequently the overall outages, Westinghouse offers the rod control cluster (RCC) change tool twospeed upgrade.

The existing RCC change tool is an effective portable device specifically designed to change rod control cluster assemblies (RCCAs) between fuel assemblies when the fuel is located in the spent fuel storage racks.

The RCC change tool is especially cost effective during a full core unload when the RCCAs can be transferred in the spent fuel pool and not in containment where the operation would consume critical fuel reload path time.

Description

The RCC change tool is supported by the hoist on the monorail of the fuel-handling machine. It sits on the top of the fuel in the racks. The operator uses the controls to lower the gripper, grasp the RCCA and withdraw the assembly fully into the tool.

The entire operation is controlled by a four-way joystick, which selects the function to be performed. The joystick is spring-loaded and centers off. Indicator lamps light to signal various conditions and locations of the grapple. The operation is protected from over travel, overload and misuse by a series of sensors and interlocks.

The existing tool utilizes a 120-volt AC single-speed motor to drive that operates at approximately six feet per minute (fpm). The controls include a geared limit switch to control the full-up, full-down, park positions and gripper operation permission. The design includes mechanical/electrical overload limits set to protect the RCCA.

Modification

Existing procedural and administrative limits for proper RCC handling are identified in Westinghouse Specification F5.1. The specification identifies hoist or gripper speeds and load limits for raising and lowering operations.

Westinghouse has developed an upgrade that when implemented on existing RCC tools offers a criticalpath savings of two to three hours for RCCA shuffle.

Modifications are made to the existing tool control system and drive motor, implementing two-speed operation for the hoist. The operator interface, operating procedures, overload and travel limits are unchanged.

The existing 120-volt AC single-speed motor is replaced with a three-phase AC motor mounted in the original position. The existing control system is modified incorporating a commercial variablefrequency motor controller, modified control circuitry and an additional geared limit switch.

The modification implements two six-fpm zones near the end of hoist travel, or one near full-up, and one near full-down positions. The slow- and high-speed zones are set and cannot be field adjusted, precluding potential maladjustment.

Westinghouse has performed design verification and tested the modification. The modification has been successfully implemented and is operating on a customer RCC tool. Implementation of this modification provides no risk for damage to the RCCA or RCCA change tool.

Based on actual customer information, a reference cycle time with a proficient operator was 15 minutes

per RCCA. After a short familiarization phase, the cycle time dropped to 12 minutes per insert. This equated to a three-hour reduction in insert shuffles. Even with trainees, the average time was 14.1 minutes per insert. Implementing the control upgrade made the two-speed operation accessible to the operator and provided good value for the investment.

Deliverables

- Modification of existing RCC change tool
- Revision of RCC change tool drawing package documenting the modification
- Revision of RCC change tool technical manual
- Certificate of Compliance to customer order requirements

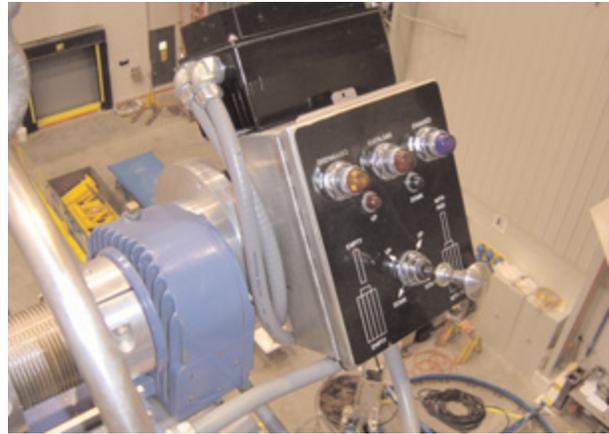
It is recommended that the upgrade implementation be performed at the Westinghouse Waltz Mill Service Center as part of the normal RCC change tool service.

Customer Scope

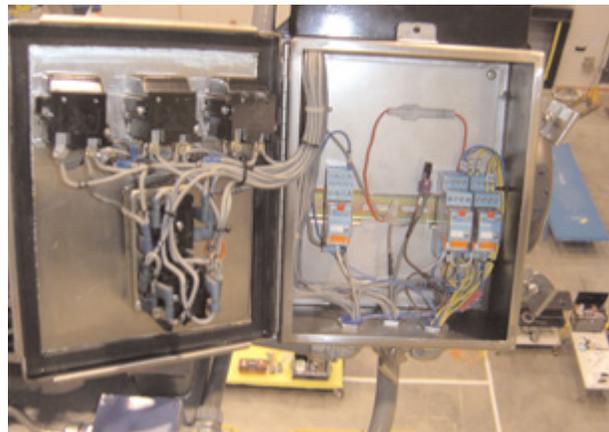
- Verification of the existing tool Westinghouse drawing number
- Provision of details of customer-installed modifications on the existing tool
- Preparation of site-specific operating procedures
- On-site disassembly and assembly of the RCC change tool

Experience

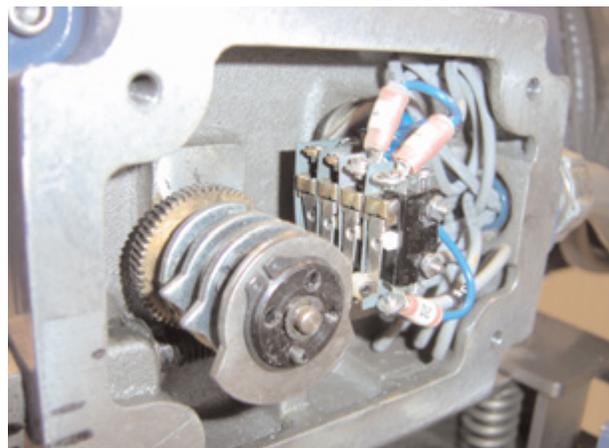
More than 45 RCC change tools are in use and the savings in critical path fuel-handling times range up to 36 hours during a single outage in the spent fuel building. Nuclear power plants where the Westinghouse modified RCC change tool are used include: Comanche Peak and McGuire.



Modified operator control panel



Modified control box



Modified geared limit switch

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