

Senior Design Project Description for FALL 2016

Project Title: Reactor Vessel Closure Head Penetration Pre-PT Cleaning Device – Phase 2 (EPRI_NDE3)

Supporter: EPRI

Supporter Technical Representative: ASSIGNED

Faculty Mentor: ASSIGNED TBD (check one)

Single Team Dual Team (check one)

Personnel (EN/ET): 2 E, Cp, Cv, 4 M, SE

(Complete if the number of students required is known)

Expected person-hours: (250 per student)

Description of Project:

This project will design and fabricate a functional prototype device to complete the pre-cleaning portion of a liquid dye penetrant (PT) examination. The radiation dose obtained from the cleaning task of a reactor vessel closure head (RVCH) penetration is particularly high when compared to the follow up tasks involved with the PT examination. Therefore, automation of the cleaning task would be very beneficial in reducing radiation dose incurred by personnel.

The prototype device can be attached overhead to the RVCH thermal sleeve by a single operator. Aluminum clamps are driven by a linear actuator that is activated by well-placed thumb switches. Once attached, device control is provided by a touchscreen-enabled handheld control box. The device has been programmed to automatically drive a small felt buffing tool to touch the weld at multiple locations to map out the necessary trajectory required to maintain contact with the surface requiring cleaning. Cleaning is then performed by an electric motor spinning the felt buffing tool against the area of interest while moving along the weld. Because it is compact, it can be installed and operated on an affected RVCH penetration while the previously installed inspection tooling performs ultrasonic examinations of the remaining RVCH penetrations.

This phase will focus on retooling the design and prototype's failed components.

Initial Project Requirements (e.g. weight, size, etc.):

The systems that would require redesign are the cleaning brush actuator and motor.

Device requirements are as follows:

- Capable of cleaning the weld crown area and area adjacent to weld
- Remote operation from at least 50 feet away
- Ability to be attached to a penetration tube by a single technician
- Device must weigh less than 20 pounds
- Working radius of less than 10 inches from axis of tube
- Capable of dispensing cleaning solution and capturing/storage of cleaning debris



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- Cleaning process complete in less than 15 minutes
- Modular platform capable of supporting future efforts to incorporate dye penetrant and/or developer application

Expected Deliverables/Results:

The end goal of the project is to have an updated prototype that has resolved the issues associated with the original prototype.

List here any specific skills or knowledge needed or suggested (If none please state none):

None