N275. Reactor Vessel Stuck Stud Removal and Stud Hole Repair

Each removal and replacement of a reactor vessel (RV) head for a PWR means the removal and replacement of up to 60 reactor vessel studs. During the removing procedure a lot of factors can result in conditions that will cause a stud to seize in place and become impossible to withdraw by normal removal techniques.

Different tools and field methods have been utilized for removing seized RV studs. Of the methods available for removing seized studs, the boring and whirling unit, is capable of quick turnaround with assured success.

In late 1992, as part of the second refueling outage activities for Unit 1, Comanche Peak sought to remove one seized stud. At the same time, as part of the start-up activities for unit 2, the utility wanted to conduct stud hole video inspection and stud hole thread repair as well as remove a stud that had seized during hot functional testing.

The length of the task was an important consideration. The removal of the stuck stud in Unit 1 was scheduled to be completed between fuel off-load and fuel reload. The unit 2 tasks needed not to delay start-up schedules. Also, ALARA concerns required that the Unit 1 work be performed as quickly as possible. TU Electric designed and installed a reactor vessel plug to minimize radiation exposure. Nevertheless, radiation fields in the vicinity of the Unit 1 stuck stud were expected to be on the order of 1 mSv (100 mrem) per hour, since the reactor upper internals are stored on the cavity floor at the vessel flange level during refueling at Comanche Peak. For these reasons and because earlier attempts to remove the Unit 1 stuck stud using other methods had proved unsuccessful, the boring and whirling unit offered the best opportunity for achieving the task objectives. Work began inside the uncontaminated Unit 2 containment. Since the inspection and repair equipment was contaminated, it was necessary to take extra precautions in establishing a radiation control area (RCA) around the work area. Once the PCA was set up, equipment was moved into place.

When the work in Unit 2 was finished, the tooling and equipment were moved to Unit 1 to remove the other seized stud. Radiological surveys indicated radiation fields much higher than anticipated. Even with the reactor vessel plug in place and extensive temporary shielding between the reactor vessel and the upper internals, radiation fields ranged from 1.5 to 2 mSv (150 to 200 mrem) per hour in the cavity close to the stuck stud. Performing the work operations quickly became even more significant in order to minimize personnel exposures.

The boring and whirling unit proved to be a prudent means for achieving the task objectives. The stud removal for each unit was completed in just over one work shift. The sleeving operations were each completed in less than two work shifts. As far as radiation exposure is concerned, the Unit 1 stud removal resulted in less than half the total person-rem than would be expected using conventional techniques.

Time is an ever important factor in decisions regarding means and methods for accomplishing outage activities, both from a schedule and ALARA perspective. With stuck reactor vessel studs occurring more frequently, the boring and whirling unit provides a means of ensuring schedules are maintained and radiation exposure is kept to the lowest level.

Taken from, "Reactor Vessel Stuck Stud Removal and Stud Hole Repair," by Brain C. Elliott, Nuclear Plant Journal, September-October 1993, pp. 54-57. For further information, contact Brain Elliott, 804/385-2336, B&W Nuclear Technologies, 3315 Old Forest Road, P.O. Box 10935, Lynchburg, Virginia 24506-0935