

Upper Head Inspections

Stephen Cumblidge and Jay Collins
NRC / Industry NDE Technical
Information Exchange Meeting
January 16-18, 2018

Motivation

In a licensee, which had replaced their head with a resistant head, claimed that significant boric acid deposits were all leakage from above, power-washed the head without performing any supplemental examinations. Other discussions with other licensees have since followed.



NRC Goals

Maintain rigor on upper-head inspections

Prevent situation where the NRC staff and a licensee have a lengthy debate the requirements for upper head inspections during an outage

Leaks Happen



Boric acid on the upper head can come from two main sources

- Leakage from seals or weld leaks in the CRDM housings
- Leakage through the annulus from PWSCC of the nozzle
- Both



Determining the source of the boric acid can be challenging



Photographs from EPRI Report 1007842

Determining the Source of Boric Acid

Chemical or isotopic analysis may be used, depending on the source of the leak

EPRI provides guidelines in the publically-available “Visual Examination for Leakage of PWR Reactor Head Penetrations Revision 2” EPRI Report 1007842

“Compressed air, in the range of 40–60 psi (276–414 kPa), or a vacuum directed at deposits has been used to distinguish whether a deposit is loose buildup of material simply resting against a penetration that is easily removed or is a tightly adhering deposit, originating from the annulus of a leaking penetration.”

(1) Components with relevant conditions require further evaluation. This evaluation shall include determination of the source of the leakage and correction of the source of leakage in accordance with -3142.3.

If one washes the relevant conditions away without any analysis, it is essentially impossible to rule out the possibility that some of the leakage may have come from a leak

VE Relevant Conditions

Current rules require that areas with boric acid or signs of corrosion be evaluated to determine the source of leakage

If leakage cannot be ruled out, volumetric inspections of the nozzle or repair are required

From N-729-4

(c) A nozzle whose VE indicates relevant conditions indicative of possible nozzle leakage shall be unacceptable for continued service unless it meets the requirements of -3142.2 or -3142.3.

-3142.2 Acceptance by Supplemental Examination.
A nozzle with relevant conditions indicative of possible nozzle leakage shall be acceptable for continued service if the results of supplemental examinations [-3200(b)] meet the requirements of -3130.

Recent OE - Palo Verde Relief

Palo Verde Unit 1 leaked reactor coolant from a vent valve

14 nozzles had boric acid indications at the nozzle annuli

Additionally, fibrous insulation particles were blown around by ventilation

Palo Verde initially left the areas with suspected fibrous insulation out of the relief and did not initially perform any additional evaluations

Palo Verde Relief cont.

After discussions with the NRC staff, the licensee performed sufficient evaluations (air blasting and additional photographs) of the additional nozzles to satisfy the headquarters and regional staff

Relief was granted to perform a VE examination on the 14 original nozzles during the next refueling outage

Future

To help get the NRC staff and licensees in agreement and understand what is expected, a draft RIS “Clarification of the Requirements for Reactor Pressure Vessel Upper Head Bare Metal Visual Examinations” is currently going through concurrence

The RIS will be out for public comments in early 2018 and is projected to be in effect by the Fall of 2018