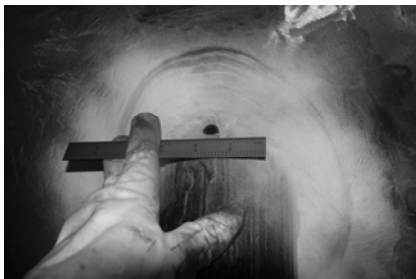


San Onofre Unit-3 RFO-15

Rejectable PT indication in an Alloy-52 CEDM overlay repair weld

1

PT defect in CEDM #64 repair weld



2

Background

- 2004 crack like indications in four CEDM nozzles repaired with A52 weld overlays (WCAP-15987)
 - SE requires refueling interval Surface Exams
 - SE requires NRC notification if flaws are detected
- 2006 all repair welds PTs were acceptable
- 2008 CEDM 64 presents large, rapid PT bleed
 - In service defect is not expected in Alloy 52
 - Necessitated NRC re-review of overlay repair
 - NRC actively supported the defect investigation

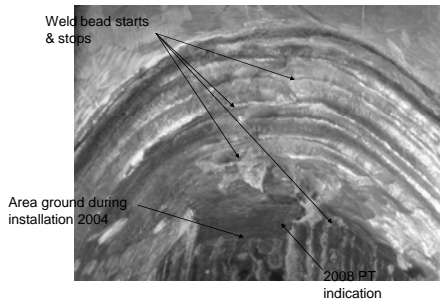
3

Initial Assessment: Weld Porosity

- Records show that a PT indication was ground out in this area during fabrication
- Observation reveals area contains numerous weld bead interfaces
 - Weld bead starts & stops prone to void formation
 - Evidence of prior grinding at the defect location
- Replica of defect captured a small surface pore
 - “comma” shape pore approximately 1/16w x 1/32d
 - Weld porosity considered to be the likely cause
 - Could be repaired by grinding & weld buildup

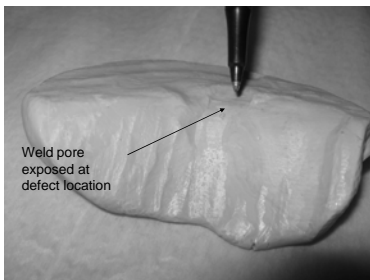
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Observed features in defect area



5

Replication of defect



6

Investigation Process

- “Emergent Issue Protocol” entered due to unexpected degradation in Alloy 52
 - NEI & PWROG informed
 - EPRI Assessment ITG is lead IP
 - Peer team assembled
- Boat Sample preparations initiated (day 2)
- SCE proposed a limited “grind & replicate”
 - EPRI concurs with a 1/16th maximum grind limit
 - NRC requests preserving bottom of pit (~1/32nd limit)
- PT after grinding resulted in a similar failure
- Defect was extracted within a boat sample – cavity restored with weld repair

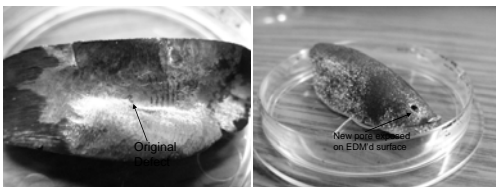
7

Boat Sample Extraction Results

- Sample extracted & cavity is re-welded
 - Actual head work completed in ~10-hours
 - 14 days after detection
 - extensive tool & procedure qualification
 - Did not impact the outage length
 - Emergent project resulted in about 3 Rem
 - Sample at 2.5 mR, very low contamination

8

CEDM 64 Boat Sample

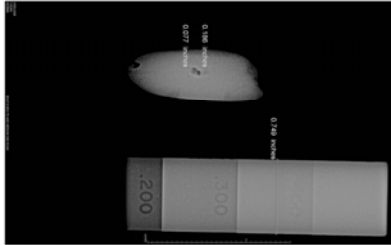


Wetted side

EDM'd side

9

On site radiograph shows void



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Approach to Destructive Exam

- Destructive exam is an industry project
 - Alloy 52 question, Not a plant specific concern
 - Why did it take two cycles to manifest itself?
 - EPRI EOC authorizes financial support of lab work
 - Team formed to guide Destructive Examinations
 - Utilities, EPRI and NRC and Westinghouse represented
 - Examination plan developed & lab contracted
 - Results expected in late March

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Lessons Learned

- **Emergent Issue Protocol provides valuable framework for obtaining resources and capturing broad Industry issues**
 - Establish and maintain confidence during emergent work
- **NRC remains concerned with in-service degradation of Alloy 690/52/152**
 - Be mindful of reporting requirements for Alloy 690/52/152 repairs
 - Generic issues are more challenging than the rework
- **Destructive Exam will provide definitive conclusion**
 - Overlapping weld bead starts & stops create vulnerability
 - Initial NDE supports fabrication voids underlying indication

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