



Dissimilar Metal Weld Qualifications

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Performance Demonstration



Outline

- Status of UT qualification for DM welds
- Demonstration Status
- Ongoing Industry Initiatives to Reduce Limitations
- Summary



Status Overview

- Qualified NDE (detection & sizing) is available for large population of DM welds
- The PDI sample set spans what we thought was the majority of configurations present in plants
 - Never planned to cover everything
 - Discovering that we don't know the actual configurations that well
- Remaining limitations to detection are primarily due to geometry
 - Tapers
 - ID geometry
 - Weld crowns
 - Adjacent welds
 - Slope of vessel nozzle
 - Short safe-ends
 - Cast SS



• Where we have good access, UT detection reliability is very high

Overview

- “Qualified” detection means--The procedure achieved 100% detection of at least 30 flaws in a range of configurations (thickness, diameter, flaw types/location, geometry)
 - Not all personnel can achieve 100% detection
 - Detection qualification for OD examination has been achieved only for smooth OD conditions
 - ID detection qualification achieved (4 teams qualified even with ID geometry conditions, others have achieved only circumferential detection)
 - Alternative techniques have been used in some cases in order to fully characterize defects properly
 - ET for flaws in close proximity to the inside surface where UT resolution is limited
 - ET for areas where geometry prohibits search unit to move completely over the flaw



Overview Cont;

- “Qualified” sizing means--The procedure achieved Appendix VIII criterion of 0.125” rmse for a minimum of 30 flaws
 - Qualification has been achieved from OD-auto (smooth surfaces up to ~2.5”)
 - manual-not achieved-larger errors
 - Sizing error for ID exceeds 0.125 rms, but is measurable and useable in flaw evaluations
 - 0.125” criteria may not be fully achievable
 - Vendors have made significant changes to software and techniques in order to achieve meaningful sizing results



Qualification Status OD

- Automated
 - 4 vendors have qualified procedures for detection and length sizing
 - General Electric
 - Framatome ANP
 - WESDYNE
 - LMT
 - A total of ; 19 candidates have successfully qualified for detection and length sizing
 - 3 vendors have qualified acceptable (<0.125 "RMS)depth sizing procedures
 - General Electric,
 - Framatome &
 - WESDYNE)
 - A total of ; 13 analyst have successfully qualified for depth sizing
 - Procedures are limited primarily to BWR configurations/thickness
 - No tapers or transitions, flush weld crowns



Qualification Pass Rates

- Manual DM Qualifications (UNAUDITED DATA)
 - OD
 - Estimated pass rates are;
 - ~ 73% detection,
 - ~33% length sizing
 - 0% depth sizing
 - No further attempts have been performed for depth sizing
 - Approximately 17 attempts, all resulted in a RMS of >0.125
 - New procedure for manual depth sizing be developed



Qualification Pass Rates

- Automated DM Qualifications (UNAUDITED DATA)
 - OD
 - Estimated pass rates are;
 - ~ 73% detection,
 - ~63% length sizing
 - ~45% depth sizing
 - ID
 - Estimated pass rates are;
 - ~91% detection
 - ~88% length sizing
 - 0% depth sizing



Qualification Status ID

- 5 vendors have qualified procedures for detection and length sizing
 - WESDYNE (USA) *
 - AREVA (USA)
 - AREVA (GERMANY)
 - INTETEC (CROATIA)*
 - IHISWT (USA)
- A total of 15 candidates have successfully qualified for detection and length sizing
- 3 vendors have demonstrated reliable depth sizing capability, but above code acceptance criteria
 - AREVA USA,
 - AREVA Germany &
 - WESDYNE
- A total of 12 analyst have demonstrated depth sizing capability within the procedure limits



Industry Initiatives to Address Limitations

- MTAG Programs
 - Conventional Transducer Research
 - Phased Array
 - EMAT
 - Fabrication of Non-Smooth Dissimilar Metal Welds
 - Research in applications to examine Non-Smooth Dissimilar Metal welds
- NDEC Programs
 - Development of Configuration Database
 - Development of Statistical Databases
 - Flexible Phased Array Technology
 - Dissimilar Metal Weld Training Courses
 - Fabrication of additional mock-ups that address gaps in qualification set
 - Assisting with the fabrication of site specific mock-ups
 - Coordination with MEOG,MRP and BWRVIP
- MRP Programs
 - Development of Inspection Guidelines
 - Includes industry guidance on what to do if qualified UT is not available
 - Survey of as-found configurations
- PDI
 - Enhancing Generic Procedures
 - Developed Site Specific Mock-up Criteria
 - Working on standardization of coverage calculations
 - Guided Practice



Summary

- Where access can be achieved, detection is highly reliable
- Configuration has strong effect on UT effectiveness
 - Still have some detection gaps for difficult configurations
 - R&D effort focused on the gaps
 - Alternative examination techniques may be required in order to fully characterize indications (ID Examinations)
- Sizing is qualified for many applications
 - Even where not qualified, sizing error is measurable (EXCEPT for MANUAL sizing)
- Un-validated Database of UT detection & sizing is available for wide range of procedures, flaw types & locations, but additional work is underway in order to effectively mine the data
- Available Queries show the range of UT capability, but need to be validated

