

U.S. NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

**Boiling Water Reactor ECCS Suction
Strainer Performance
Issue No. 7 – ZOI Adjustment for
Air Jet Testing**

**BWROG Meeting
July 20, 2011**

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Background

- Correction factor (40%) applied to air jet testing results
 - In safety evaluation for NEI-04-07 (for PWRs)
 - Based in part on potential enhanced debris generation for two phase jets in PWRs
 - NRC staff identified 40% factor as an example of disparate treatment between PWRs and BWRs
- BWROG challenged need to apply 40% factor to BWRs
- NRC staff re-reviewed available test results



NRC Staff Review of Test Results

- Existing experiments are not conclusive
 - Not clear whether two-phase jets are more damaging at a given target stagnation pressure
 - ZOI is normalized to stagnation pressure
 - No direct test comparisons
 - Large uncertainties in comparing test results
 - Scaling
 - Target Configuration Differences
 - Limited data
 - Destruction pressure not always identified during testing
 - Results likely dominated by target differences
 - Apparent inconsistencies in damage thresholds



Preliminary Conclusions

- NRC staff concurs that 40% factor does not need to be applied to BWRs
 - Use stagnation pressure without correction for jet media
 - Steam or recirculation loops
- However, margin should be added to damage pressure of some materials
 - Based on observed damage in tests
 - Focus is overall consistency in debris amounts and characteristics



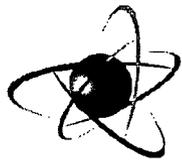
Preliminary Damage Pressures

- **NUKON - unjacketed**
 - Damage pressure 6 psi (vs. 10 psi)
 - At 6 psi, cloth cover completely removed, 2% fine/small
 - At 10 psi, more significant damage, 6% fine/small
- **NUKON – jacketed**
 - Damage pressure 6 psi (vs. 10 psi)
 - All tests show significant damage
 - No testing below 11 psi
 - Damage pressure based on un-jacketed NUKON due to lack of data



Preliminary Damage Pressures (cont.)

- CalSil - jacketed
 - Damage pressure 24 psi (vs. 150 psi)
 - AJIT results invalid because no testing of vulnerable seam angles
 - Damage pressure based on OPG testing
- Min-K - unjacketed
 - Damage pressure 2.4 psi (vs. < 4 psi)
 - At 4 psi, 70% fines/smalls – large amount of damage
 - Damage pressure based on largest ZOI determined for any material



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Preliminary Damage Pressures (cont.)

- Koolphen –unjacketed
 - Damage pressure 4 psi (vs. 6 psi)
 - At 6 psi, 32% fines/smalls – large amount of damage
 - Damage pressure based on margin below pressure at which significant damage occurred
- Knauff –unjacketed
 - Damage pressure 6 psi (vs. 10 psi)
 - At 6 psi, 0.4 % smalls/fines
 - At 10 psi, 37 % smalls/fines – large amount of damage
 - Damage pressure 6 psi based on no intermediate data points



Preliminary Damage Pressures (cont.)

- Mirror with standard bands
 - Damage Pressure 2.4 psi (vs. 4 psi)
 - At 4 psi, large amount of damage
 - At 2 psi, 2 intact assemblies with some pieces released
 - Damage pressure from NEI-04-07



Preliminary Damage Pressures (cont.)

- Jacket Systems
 - Additional credit can be taken for jackets if:
 - Seams are in protected positions
 - or
 - Insulation is double-jacketed and double-banded such that the seams are always protected
 - Applies to target pipes