ECCS Suction Strainers
Debris Head Loss Correlations
Issue No. 3

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ECCS Suction Strainers Committee

Chairman

NRC / BWROG Resolution Plans
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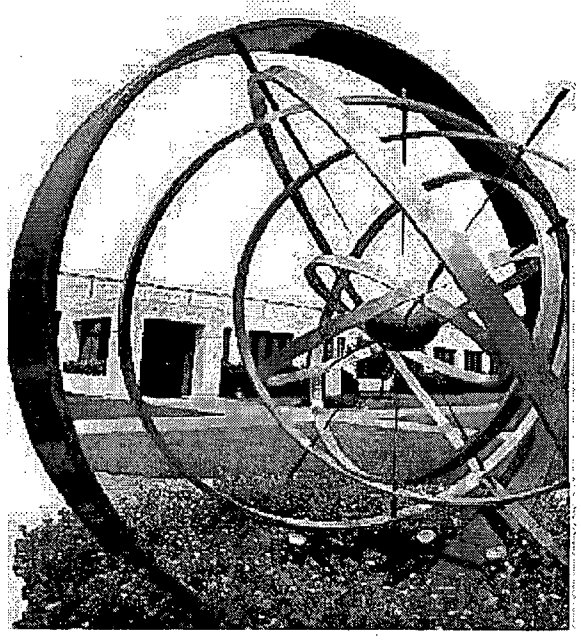

Topics

Regulatory Summary

Issue Summary

BWROG Objective

Resolution Strategy

Relationships to Other Issues

Next Steps and Milestones

Regulatory Summary

The NRC identified three head loss related issues in the November 27, 2007 Presentation by Ralph Architzel (NRC) to the BWROG:

1) treatment of "microporous" debris and Calcium Silicate insulations that may result in high head losses,
2) the application of the NUREG/CR-6224 correlation in the strainer design process, and
3) the treatment of thin fibrous/particulate debris beds (thin beds)

Problem Statement

Semi-empirical debris head loss correlations may not accurately predict head losses, for thin beds or microporous / Cal-Sil debris

BWROG Objectives

- Provide generic assessment of validity of existing plant analyses (Assessment)
- Provide supplemental generic data to resolve selected uncertainties (Test Program)
- Develop supplemental guidance on head loss assessment, as required, for selected plant-specific analyses (Supplemental)

Expectations:

- Most analyses will be demonstrated to be adequate
- Most debris loads will not create a thin bed effect

URG Background

Generic headloss correlation was proposed but not accepted

No specific guidance on testing

Headloss dealt with on a vendor and plant-specific level

GSI-191 Background

NEI 04-07 proposed the use of NUREG/CR-6224 headloss correlation but plants opted for testing

Staff Review Guidance of March 2008 provided criteria for headloss testing, specifically for thin-bed testing

Resolution Strategy – Assessment

1) Develop survey for plants to report head loss assessment basis
   - Did debris mix include
     - CalSil
     - Microporous
     - Other (Asbestos, etc.)
   - Were head loss results based on
     - Plant-specific testing
     - Correlation w/ confirmatory plant-specific test
     - Vendor-provided correlation
     - Other criteria (thin bed, for example)
   - If based on correlation, bounded by generic test(s)?
   - If plant-specific tests were conducted, determine
     - Debris characteristics versus transport analysis
     - Debris introduction process
     - Debris settling impact

Resolution Strategy – Assessment

2) Develop survey for vendors to report basis for correlations
   - Range of conditions tested
     - Debris types
     - Debris quantity
     - Flow
   - For all generic tests conducted, determine
     - Debris size characteristics used
     - Debris introduction process
     - Debris settling
   - Basis for correlation developed/used
     - Range of applicability

Resolution Strategy – Assessment

3) Possible survey outcomes

- Plants covered by test data
- Plants relied on correlation within range of applicability
- Correlation used outside range of applicability
  - Debris type
  - Debris quantity
- Acceptable basis for thin-bed conditions: Y/N
- Testing Consistent w/ NRC Guidelines
  - Debris handling
  - Thin/Thick beds

Resolution Strategy – Test Program

1) Execute Generic Thin-Bed Test Program
   - Test Plan w/ NRC review
     - Strainer geometry
     - Debris types
     - Debris quantity (per unit area)
     - Flow (per unit area)
   - Test Procedures
     - Debris characteristics
     - Debris introduction process
     - Debris settling control
     - Termination criteria
   - Test Execution
   - Generic Test Results
     - Minimum debris quantities for thin bed
     - Head loss data for low debris quantities

Resolution Strategy – Supplemental

For plants that are outside the bounds of the work done in the Assessment and Testing phases

1) Analysis guidance
   - Criteria for application of correlation to plant conditions
   - Criteria for treating "new" debris types
     - Methodology for small quantities
     - Threshold quantity

2) Testing guidance
   - Debris characteristics (preparation)
   - Debris introduction
   - Settling avoidance (Issue 11)
   - Termination Criteria (Issue 11)

Relationships to Other Issues

Issue 4: *Chemical Effects*

- Chemical precipitants may increase the head loss through the debris bed on the strainer and should be considered in strainer head loss predictions.

Issue 5: *Assessment of Coatings*

- Magnitude of unqualified coatings is a contributor to the calculated coating debris load.

Issue 10: *Debris Characteristics*

- Strainer head loss correlations or head loss tests used to predict strainer head loss should properly address the expected LOCA debris characteristics reaching the strainer.

Issue 11: *Near Field Effect and Scaling*

- The effect of debris settling near the strainers during head loss testing needs to be considered.

Next Steps and Milestones

Preliminary Assessment of Existing Analyses

- Develop Surveys (in conjunction w/ Issue 11) 1Q 2011
- Issue Survey to Industry and Vendors 2Q 2011
- Prepare Preliminary Assessment Report 3Q 2011
- Issue Guidance document 3Q 2011

Thin-Bed Testing

- Develop Test Program 4Q 2012
- Conduct Tests & Prepare Test Report 2Q 2013