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Coated Surfaces in Power Plants

Life Beyond 60

Breakout #3: Management of Age-Related Material Degradation issues

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EPRI Materials Reliability Program

Coated Surfaces in Power Plants

- Affected Components
  - Reactor containment
  - Above ground pipe and vessels
  - Buried pipes, and tanks
- Coatings fail primarily due to chemistry with the environment
  - Coatings absorb gases or liquids at varying rates
  - Eventually disbonds
  - Leads to formation corrosion cells

What are long term effects of radiation?

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Evaluation of Coating Failures and the Potential Influence of Aging

- The nuclear industry has experienced instances of degradation of the protective coating systems applied inside reactor containment (Service Level 1 coatings).

- In response, EPRI is conducting research to:
  - Gain an understanding of the coating degradation and
  - Evaluate the effects of aging on the qualified coatings used inside containment

- Future R&D should concentrate on longer term

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Coated Surfaces in Power Plants

- Coating life is difficult to predict.
- It depends on
  - Environment
  - Coating type
  - Coating thickness
  - Base material
- Need improved testing and prediction models

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Service Level I Coatings, Before and After

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Possible Life Beyond 60 Coating Project

- Project phases:
  - Task 1: Coatings Degradation Utility Survey
  - Task 2: Coatings Degradation Research
  - Task 3: Containment Coatings Adhesion Testing
  - Task 4: Coatings Aging Research
  - Task 5: Long-term Performance Integrity of Coatings

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Example:
Task 4: Coatings Aging Research

- Long term research project
- Coating systems used in the fleet will be subjected to:
  - thermal oxidation aging tests
  - radio oxidation aging tests
- **Purpose is to evaluate the affects, if any, on coating service life as a result of the normal operating environments to which the coatings are exposed.**

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British Energy – Sizewell B: High Density Polyethylene Piping

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Summary
80 Year Coating Attributes

- Last for 80 years
  - Corollary: Use materials not requiring coating
- Easy to apply perfectly
  - A majority of degradation related to application
  - Surface preparation results in loose particles
- Self regulating cathodic protection system that supplements coatings as degradation increases
- Accelerated tests are accurate
- Self monitoring
  - Monitor thickness, adhesion, and coating ‘gaps’
  - Application for nano-technology?

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