

Presentation to the ACRS
Spent Fuel Pool Studies
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Revisions Ex 2 & Ex 4 5

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SFP Studies

- **Background**
- **Updated SFP analyses**
- **Mitigation**
- **SFP testing**
- **NAS review**
- **Ongoing and new analysis**

SFP Analysis Background

- Past NRC generic studies often assumed “bounding” configuration for T/H heatup analysis, pool fully racked and full, minimal clearances, fuel of uniform (most limiting) decay power, fission product release fractions assumed.
- New analysis focused on phenomenological modeling, in greater detail, fluid flow and heat transfer, representative geometries and fuel loading configurations (based on detailed licensee info).
 - CFD calcs (laminar flow losses, mixing)
 - Separate effects MELCOR calcs
 - Integrated pool MELCOR calcs
- New analyses address mitigation strategies
- Oxidation kinetics testing at ANL completed
 - Recently completed testing of hydrided samples

SFP Testing

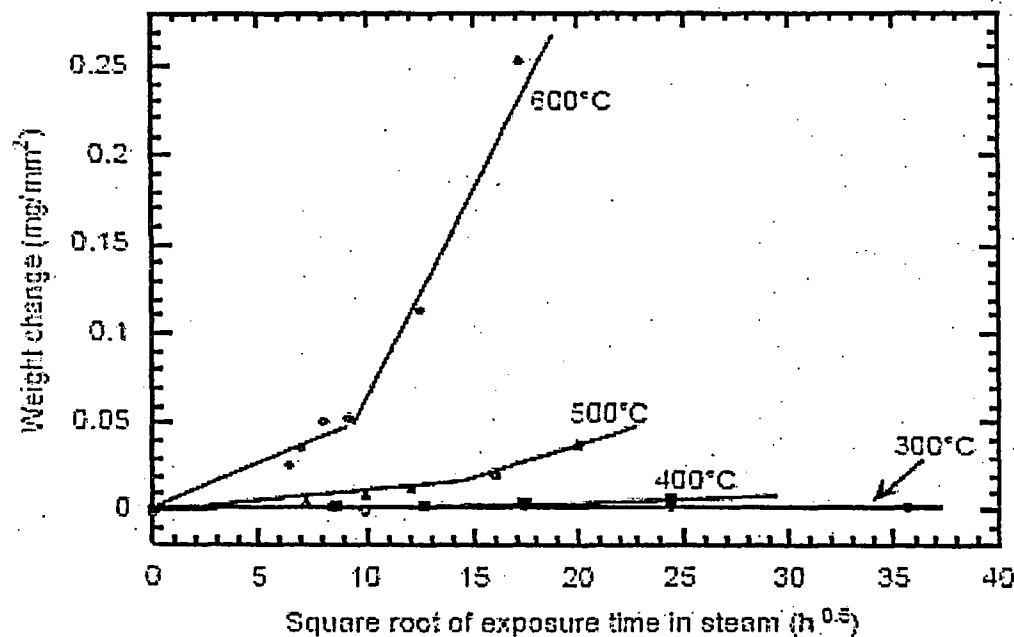
- Air oxidation rate kinetics testing at ANL
 - Testing completed, final report in preparation
 - Pre-oxidized, hydrided
 - Zircalloy and zirlo
- Spent Fuel Pool Heatup and Propagation Testing at SNL
 - Simulation of decay heat + air oxidation with non fueled prototypic assembly and sfp rack design
 - Confirmation of laminar flow modeling and convective cooling including interstitial bypass
 - Partial draindown and within-assembly countercurrent natural circulation

Ex 5 portions

Ex 5

Ex 5

Zr Air Oxidation Rate Measured by Isothermal Weight Gain Tests



- Zr samples oxidized in air at constant temperature
- Oxidation determined by weighing samples after different exposure times
- Weight gain appears linear against square root of time
- Parabolic expression of oxidation
 - $dw^2/dt = K(T)$
- Breakaway phenomena leads to step change in oxidation rate in late time

$$\frac{dw^2}{dt} = k(T)$$

$$W_{new}^2 = W_{old}^2 + k(T) \cdot \Delta t$$

NAS Review

- Series of meetings held to brief ad-hoc Committee on safety and security of Commercial Spent Nuclear Fuel Storage

- 12/03/03 Introductory mtg with Board (open mtg with presentations by Alvarez, von Hippel, NRC)
- 2/13/04 closed mtg with NRC staff
- 3/5/04 closed mtg with NRC staff
- 5/11/04 closed mtg with SNL staff and NRC

Ex 2 portions

Ex. 2

Ex. 2

NAS Review

- NAS review has focused on

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- NAS visit to plant sites

- Potential improvements

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Ex 2 portions

Ongoing and New Analysis (cont)

- Follow-up analysis of BWR pool

- Scenario variations

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- Mitigation strategies

- Consequence analysis

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Ex 5 portions