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R-403

ACTIVITY PICKUP BY COATED COUPONS EXPOSED IN THE DOEL REACTOR

Keywords: CONTAMINATION PREVENTION; SURFACE
PRETREATMENTS; SURFACE CONDITIONING; ELECTROPOLISHING;
PREFILMING; PREOXIDATION

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Project Manager:

Objectives: Study various surface pretreatment techniques for reducing out-of-core radiation level buildup.

Comments: Over the past several years, a cooperative program between EPRI and the Belgian utility has been underway to study various surface pretreatment techniques for reducing out-of-core radiation level buildup. The program involves exposure of pretreated coupons made from materials similar to those used in the construction of PWR primary systems. After exposure in the plant for a fuel cycle, the coupons are analyzed to determine the level of deposited activation corrosion products.

Remarks/Potential for dose limitation: Early test results showed a distinct advantage in first electropolishing a surface to reduce true surface area and leave it in a clean, microscopically smooth state. After electropolishing, pre-filming the electropolished surfaces further reduces corrosion and deposition on the surface. Pre-filming methods involved applying thin films of inert materials (e.g., palladium) and pre-oxidation of the base metal itself after electropolishing. The electropolished and preoxidized surface greatly reduces the activity buildup in BWR plants and the initial tests showed similar results in the PWR primary system. The main reason for the corrosion and deposition resistance is believed to be due to the chromium enrichment of the oxide film grown. A technique of first applying a very thin chromium film and then incorporating this chromium into a protective oxide coating proved very successful at Doel. Reduction factors in activity buildup of up to 20 were observed. A second test was run wherein only a chromium film was tested (without the pre-oxidation or stabilizing step) which was also very encouraging. The stabilized chromium film has been applied to new coupons for longer term testing at Doel as well as to plant piping for full-scale evaluations.

References: Asay, R.H., "Activity Buildup by Coated Coupons Exposed in the Doel Reactor," *Radiation Field Control Seminar*, Electric Power Research Institute, Seattle, Washington, 1993.

Duration: from: 1991 to: 1993

Funding: N/A

Status: In progress

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