

BNL ALARA Center Data Base

U.K.

R-359

ENRICHED BORON PRODUCTS

Keywords: COMPONENT RELIABILITY; BORON; ENRICHED BORIC ACID; WATER CHEMISTRY; STRESS CORROSION CRACKING

Principal Investigator:

Dr. Veronique Goehlich
Eagle-Picher Industries Materials GmbH
An der Lehmgrube 14
D-74613 OERINGEN
GERMANY

Project Manager:

Phone: 49-7941-6030

Objectives: Document the usefulness of enriched boron products in nuclear power plants, specifically enriched boric acid at PWRs and enriched sodium pentaborate at BWRs.

Comments: In PWRs, boric acid is used as a solubility reactivity control agent and is referred to as a chemical shim because of the high capture cross section (3815 barns) for thermal neutrons exhibited by the boron 10 isotope contained in the boric acid. Using enriched boric acid (EBA), which is enriched to 99% B-10, allows for the decrease of total boron concentration without changing the boron 10 content of the reactor cooling water. In order to maintain the pH level of the water, the quantity of lithium hydroxide needed is dramatically reduced as well. This keeps the lithium limits below concentrations thought to accelerate Zircaloy corrosion and may eliminate or delay initiation of primary water stress corrosion cracking of steam generator tubes.

In order to upgrade the stand-by liquid control systems in BWRs, a solution more concentrated in boron 10 was needed. Enriched sodium pentaborate was developed for this purpose.

Remarks/Potential for dose limitation: The use of EBA could allow longer fuel cycles, reduced man-rem exposure, reduced maintenance costs, and prevent major plant modifications such as enlarging the boric acid tanks when going to lower concentrations or higher burn-up fuels. Greater safety, reduced corrosion and plant life extension are just some of the possible benefits of using enriched boron products.

References: Goehlich, V., "Enriched Boron Products," *Water Chemistry of Nuclear Reactor Systems 6*, Vol. 1, pp. 187-189, British Nuclear Energy Society, London, 1992.

Duration: from: 19 to: 1992

Funding: N/A

Status: In Progress

Last Update: September 3, 1993