BNL ALARA CENTER

Processes and Practices Related to Occupational Dose

ID: 70

COBALT REDUCTION WITH COBALT-FREE HARDFACING ALLOYS IN BWRS

Keywords: COBALT-FREE HARDFACING ALLOYS; CONTAMINATION PREVENTION; CONTAMINATION REDUCTION; COBALT; CONTROL ROD PINS; CONTROL ROD ROLLERS; INCONEL X-750; PH13-8 MOLYBDENUM; STAINLESS STEEL 440C; STELLITE

Description:

The most significant in-core source of cobalt for BWRs are control rod pins and rollers. These may account for as much as 75% of the total cobalt-60 inventory. Cobalt-free alloys such as Inconel X-750 is now being used in many plants for replacement rollers, PH13-8 molybdenum and Nitronic-60/CFA are being used for pin replacement.
The most significant out of core source of cobalt is due to wear of feed water regulatory valves. Valve maintenance operation is a moderate source of cobalt. The use of type 440C stainless steel, which is a cobalt-free alloy, may be a suitable alternative as a replacement for stellite hard-facing materials which have very high concentrations of cobalt. Under EPRI project RP-1P35, tests showed type 440C stainless steel could remove a significant source of cobalt 60.

Results of EPRI project entitled "Laboratory Evaluations of Iron-Based Hard Facing Alloys" show that Everit 50 responds similarly to Stellite 6 in a variety of ware and corrosion tests. Because Everit 50 is already available in the form of welding rods (4- to 8-mm in diameter), utilities may be able to use this alloy to refurish valves.

In EPRI project numbered RP 1935-5, galling wear tests on the three iron-based alloys measured the ability of contacting surfaces to resist material transfer at high stress. Everit 50 shows wear resistance as high as that of the NOREM iron-based alloys developed by AMAX and described in EPRI reports NP-4237 and NP-4775. Another EPRI study, project RP1935-14 will test Everit 50, the NOREM alloys, and alloy EB 5183 developed by Stoody Deloro Stellite, Inc. This project will evaluate the performance of these alloys after deposition in 3-inch gate valves under conditions that simulate reactor operations.

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