BNL ALARA CENTER

Processes and Practices Related to Occupational Dose

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MAINTENANCE CLEANLINESS PROGRAMS

Keywords: MAINTENANCE CLEANLINESS; OPERATIONAL AND MAINTENANCE TECHNIQUES; IMPROVED PROCEDURES; CONTAMINATION PREVENTION; CONTAMINATION REMOVAL; VALVE SEAT MAINTENANCE; LAPPING OR MACHINING OF VALVE SEATS; DEBRIS; CLEAN UP PROCEDURE

Description:

Cobalt-60 is the principal source of out-of-core radiation contamination in light-water reactors; thus, it is the primary source of radiation to which power plant workers are exposed. Because radioactive cobalt-60 is formed by the irradiation of stable cobalt-59, entry of cobalt-59 into reactor systems must be strictly limited. Debris from valve seat maintenance operations constitues a significant portion of the total cobalt introduced into light-water reactor systems. Although only small amounts of material are removed when the seats are ground, much of it (about 40%) remains in the valve from which some can be carried to the reactor. Cobalt contamination problems can be effectively mitigated over the short term by stricter and closely monitored cleanup practices and by decreasing the number of in-valve seat grindings. Eventually, the problems can be virtually eliminated by improving valve designs to decrease maintenance and minimize cobalt by using alternative hard-facing materials.

References and Selected Abstracts:

1. Naughton, M.D., "Cobalt Contamination Resulting From Valve Maintenance," EPRI-NP-3220, Final Report, August 1983.

2. Nukazuka, H., Terada, H., Morikawa, Y., Tomura, S., "Result of Clean Plant Operation Tactics in Onagowa Nuclear Power Station No. 1 Unit During the First Fuel Cycle and the First Maintenance Outage," Tohoku Electric Power Co., Ltd., Sendai, Japan, June 1986.

ABSTRACT: On June 1, 1984, No. 1 plant in Onagowa Nuclear Power Station started commerical operation and recorded the nonstop operation for 344 days. The parallel off was made on April 3, 1985, and the first regular inspection was carried out. On July 12, 1985, the regular inspection was completed, and thereafter, the second cycle operation was smdothly continued. Special attention was paid to the measure for reducing radiation exposure and the attainment of the clean plant was aimed at. As measures for reducing radiation level, the strengthening of purifying facilities, the suppression of crud generation, the adoption of low cobalt material, and the strengthening of shielding were carried out. For shortening exposure time, the machinery and equipment were improved, paying attention to automation, remote operation and labor saving, and the improvement of reliablity, maintainability and inspection. In addition to these design measures, in the construction, operation and regular inspection, the clean plant measures were taken. Very good results were obtained.

3. Ocken, H, "Cobalt Reduction Guidelines," EPRI-NP-6767 Special Report, March 1990. pp. 1-2.

ABSTRACT: Various approaches for minimizing the radiation levels caused by cobalt-60 on system surfaces have been developed including: decontamination to remove deposited cobalt-60 and other nuclides from system surfaces. Water chemistry changes to reduce deposition of corrosion products, including cobalt-59, on fuel rod surfaces in the core, and thus to reduce the transmutation of cobalt-59 into radioactive cobalt-60. Water chemistry changes to reduce the rate of pickup of cobalt-60 by corrosion films that form on component surfaces. Reduction of cobalt input into the reactor by minimizing the amount of cobalt left in the system components following in-situ maintenance. Reference identifies procedures to achieve this goal. Many plants now have improved cleanup procedures following lapping or machining of valve seats. Reduction of cobalt input into the reactor by minimizing the amount of cobalt present in plant materials that can, as a result of corrosion, erosion or wear, contribute cobalt to flow streams leading to the reactor coolant system and the core. There are a large number of valves that currently have high-cobalt hardfacing, but do not require any hardfacing on a functional design basis.