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SELECTION OF THE OXIDATION STEP IN CHEMICAL DECONTAMINATION

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Objectives: To examine the effectiveness of various oxidation processes employed for chemical decontamination. To investigate any problem areas.

A number of oxidation steps have been used in chemical decontamination. In the US these steps have been based on alkaline potassium permanganate (AP) or nitric acid potassium permanganate (NP). Work has been done outside the US on permanganic acid (HP). Originally in the US AP was the main process used. In early 1980s researchers at the CEGB in UK identified the NP process and found that it gave higher decontamination factors (DF) for stainless steel while AP was more effective for inconel. From mid 80s to late 80s NP was the method of choice. However, when the pretreatment steps started to be circulated through the reactor annulus in BWRs it was found that crack growth rates could be enhanced by the NP process. Use of NP stopped immediately and only the AP step was used.

Comments: With the recent use of BWR Hydrogen Water Chemistry (HWC) and the injection of Zinc in the Reactor Recirculation Systems (RRS) the decontamination chemicals have been found to be ineffective at most plants. These decontaminations employed the AP process. Recently a BWR plant operating under HWC applied the LOMI process with the NP pretreatment step and found the decontamination to be successful. The NP process was applied because investigators identified that the crack growth rate of 508 Class 2 material was not increased if the plant was operating under HWC.

Potential for dose limitation: The full-system decontamination program sponsored by EPRI, Con Edison, ESEERCO, and a large group of utilities utilized the AP as the pre-oxidation step for both the CANDEREM and LOMI processes. Both the AP/CANDEREM and AP/LOMI processes have passed the materials qualification reviews and have been accepted by Westinghouse for use in full reactor coolant system. They are included in the Topical Report approved by the NRC.

In this study the typical operational parameters of the AP and NP processes have been investigated. The results of AP, HP, and NP processes have been compared regarding the time requirements, the decontamination factors and the amount of waste generated by each of the

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U.S.A.

R-443

three processes available. Also, the rate of chromium dissolution versus the concentration of the permanganate have been investigated.

References: 1. Remark, J.F., "Chemical Decontamination Oxidation Step Selection and Effectiveness," Proceedings, EPRI Radiation Field Control and Chemical Decontamination Seminar, Tampa, Florida, November 1995, available from EPRI Distribution Center, P.O. Box 23205, Pleasant Hill, CA 94523, Phone: (501)934-4212.

2. "Full Reactor Coolant System Decontamination Program Generic Topical Program Report", WCAP-12932, Volumes 1 & 2, July 1991.

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