

“Application of Hi-F Coat for Recontamination Reduction at Shimane Unit 1”

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The Hi-F coating was applied at Shimane Unit 1 during the 27th periodic inspection for the first time as a measure to prevent recontamination after the chemical decontamination process. The PLR piping dose rate measured at the 28th periodic inspection showed that the recontamination was reduced to 1/2 to 1/3 the levels prior to the application.

The Hi-F coating is a technique to form a dense, thin magnetite film on metal surfaces from which oxide film was removed by chemical decontamination. The dense magnetite film prevents the diffusion of oxygen and metals, thus lowering the metal corrosion rate, and resulting in a decrease in the rate of Co adhesion

The chemical decontamination and Hi-F coating were applied to both A and B loops. The application area was divided into two areas: the PLR pump inlet valve – riser piping, and the PLR pump inlet piping – middle of outlet piping; a total of four applications of Hi-F coating were carried out. The Hi-F coating was performed by injecting iron formate solution, hydrogen peroxide, and hydrazine. The thickness of the film obtained after the treatment was 270 µg/cm², which is considered to be sufficient for the purpose of Co adhesion reduction, based on our experimental data.

At the 23rd periodic inspection, one cycle after the application of chemical decontamination, recontamination of the PLR piping was found at an accelerated rate at Shimane Unit 1 (please see the figures below). The dose rate had been on an upward trend after the commencement of hydrogen injection; at the beginning of the 26th cycle, an NWC operation was carried out for 54 days to stabilize the oxide film on the decontaminated surface, which showed tendency to recontamination. At the 27th periodic inspection, the dose rate reached the maximum, and chemical decontamination and Hi-F coating were applied. Further, at the beginning of the 28th cycle, a 90-day NWC operation was carried out. As a result, the dose rate of the PLR piping at the 28th periodic inspection was 0.4 mSv/hr, a decrease to about half the previous contamination levels. The effect of recontamination reduction by the combination of NWC operation and Hi-F coating application is estimated to be 1/2 to 1/3 the previous level.

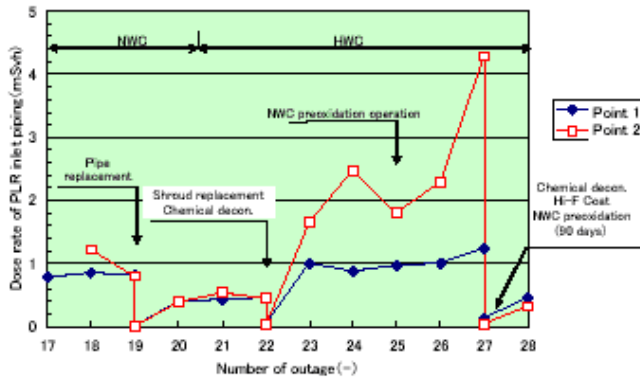


Fig. 3 Dose rate of PLR inlet piping

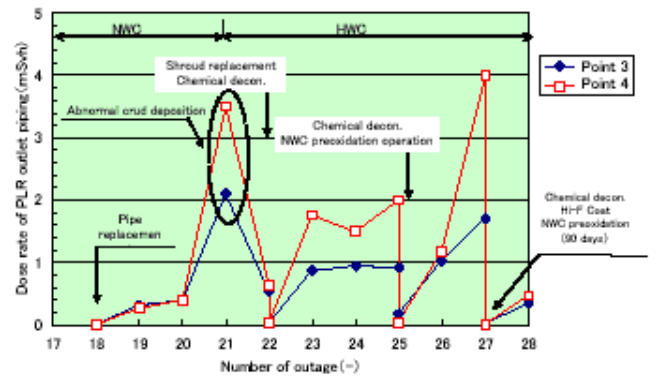


Fig. 4 Dose rate of PLR outlet piping

The film formed by the application of Hi-F coating has been confirmed to be easy to remove compared with normal oxide films. We are now in the process of studying combinations of Hi-F coating and zinc injection in order to further reduce the dose rate; based on the experimental data, the combination of a Hi-F coating and zinc injection is more effective in reducing Co adhesion on stainless steel surfaces.