

Introduction of dose reduction technology

“Approach of Hitachi for Dose Rate Reduction”

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This is the report for dose rate reduction measures especially focusing on the oxide film characteristics. In general, it is said that as oxide film grows, the accumulated radionuclide increases; however, by using prefilming to form oxide film before the operation of plant, the growth of oxide film after the operation and the accumulation of radioactivity are suppressed. Alkaline prefilming has been applied to pipes in RWCU system of 4 plants, and ^{60}Co deposition coefficient became half compared with the one without prefilming.

Chemical decontamination is the method to reduce the accumulated radioactivity by removing oxide film and deposited cruds. In chemical decontamination, HOP method (hydrazine, oxalic acid, potassium, permanganate) is used. Hitachi has experiences of 20 times in applying HOP method to 13 plants. However, it is recognized that there are some cases in chemical decontamination methods where the dose rate of piping is restored after the resume of operation for short time, which means serious recontamination. Recontamination is more serious under HWC circumstance than under NWC circumstance, but by using NWC prefilming for 200 hours before HWC operation, recontamination under HWC circumstance can be greatly suppressed. Forming oxide film without radioactivity after chemical decontamination is effective to suppress the accumulation of radioactivity.

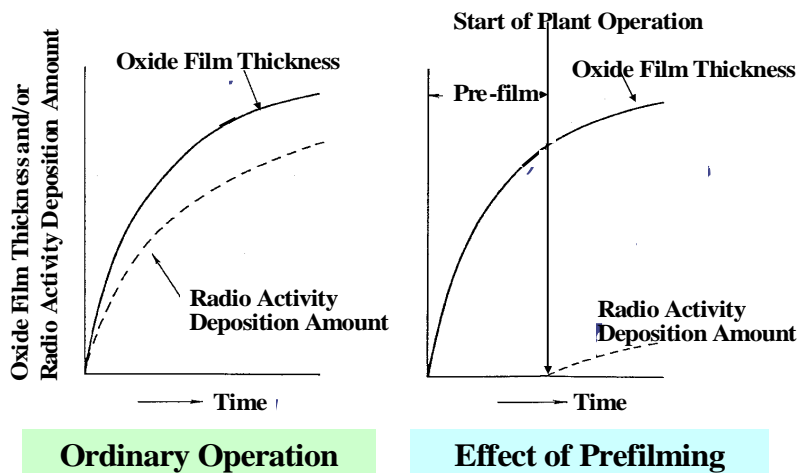
Recently, Hitachi found that by forming a thin closely packed ferrite film on the piping surface, radioactivity incorporation in oxide film was quite effectively suppressed (Hi-F Coat : Hitachi Ferrite Coating). By using Hi-F-coat, ^{60}Co deposition coefficient is reduced by around 1/5 of the previous coefficient value. We used 1/10 scale model to experiment but will use actual machine model.

Dose Rate Reduction Methods Hitachi Recommends

Construction Phase	Operating Phase	
	NWC*	HWC**
/Adopt low cobalt mater.	/Apply Fe/Ni ratio control	
/Adopt wear resistive mater. (Hitachi Hyper Valve)	/Apply chemical decontamination (HOP)	
/Apply surface polishing (for S/S pipings)	* NWC: Normal Water Chemistry ** HWC: Hydrogen Water Chemistry	/Apply H ₂ O ₂ precond. after decon. of PLR
/Apply Alkaline Prefilming (RWCU)		/Apply HiF-Coat. after decon. of PLR
	/Apply Zn injection	
	/Apply RHR low temperature operation	
	/Replace to wear resistive mater.	

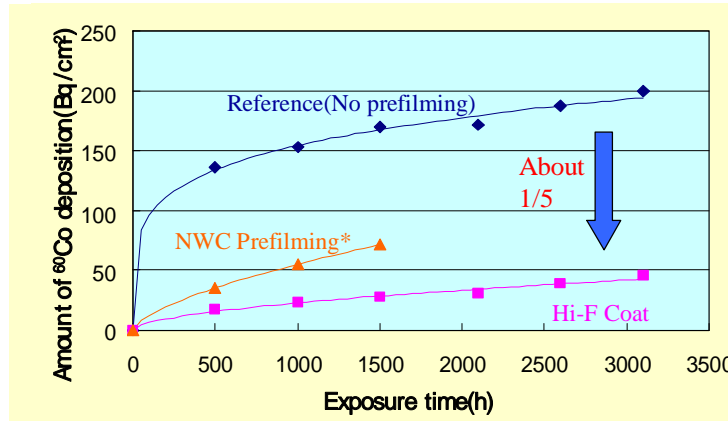
Reduction of conc.
 Reduction of

Concept of Prefilming



Countermeasure to reduce the Dose Rate — Hi-F Coat — (Effect on RI Deposition)

Co-60 deposition in HWC could be suppressed by Hi-F Coat



*:200 hours pre exposure in NWC before HWC