N117. Zinc Injection Helps Reduce Radiation Field Buildup In BWRs

An EPRI workshop in September 1990 concluded that zinc injection is now a mature technology and will probably be implemented by most U.S. BWRs that do not already have significant naturally-arising concentrations in their reactor water.

There are 13 plants using, or committed to using, zinc injection, representing about 30% of the fleet of GE BWRs. Eight plants currently use zinc injection. Of these, 3 plants started zinc injection relatively early in life, and 5 are older plants. Of the eight plants, 5 are using normal water chemistry. Five plants have backward-pumped drains, and 3 forward-pumped drains.

Normal Water Chemistry (NWC). The main conclusions for NWC plants were that radiation fields are reduced significantly by the presence of zinc, with a larger effect on fields around piping, and a smaller effect on general area fields due to the presence of crud traps which are not greatly affected by zinc. Long-term trends are uncertain, due to many plants using zinc in conjunction with cobalt replacement and following decontamination. The database will become much more extensive in a year or so, as several plants have recently implemented zinc injection. BWR plants with forward-pumped heater drains (FPHD) tend to have higher radiation fields than plants with backward-pumped heater drains, partly because cobalt input tends to be higher. In fact, 4 FPHD plants with low natural zinc levels are towards the upper end of the band of U.S. experience. Nine Mile Point 2, which injected zinc from start-up, had piping fields at least a factor of two lower than typical FPHD plant experience. The zinc-65 problems observed in the first zinc applications in NWC plants seem to have been overcome, and there have recently been no major zinc-65 problems. However, it is important to realize that iron input from the feed train be minimized. The performance of the zinc injection equipment has consistently improved and early results from a new "passive" injection system at Leibstadt (Switzerland) are encouraging.

Hydrogen Water Chemistry (HWC). The situation with HWC is more complex. Shutdown radiation fields increase significantly on switching from NWC to HWC. Data from plants that have recently adopted HWC show a bigger impact of HWC than was observed at Dresden 2, which has a larger reactor water clean-up system. Zinc has not been as effective as hoped in mitigating this increase, although there seems to be significant benefit from zinc injection. Promising data suggested that zinc reduces the magnitude of the cobalt-60 peak found in the reactor coolant water after changing chemistry, but there have also been significant increases in zinc-65 concentrations.

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