

N200. Water Chemistry and Dose Reduction: Millstone 3 Experience

A demonstration of elevated pH at Millstone 3 yielded results consistent with earlier experience at the Swedish Ringhals units. The Millstone 3 demonstration began shortly after the start of the plant's second cycle. Plant chemistry staff maintained the lithium concentrations at 3.35 ± 0.15 ppm until the pH reached 7.4; the pH was then held constant until the end of the cycle.

The beneficial effects on radiation fields were significant: steam generator channel head fields decreased by 10% and piping fields increased by 30%. This compares with predicted increases of 33% and 100%, respectively, for the typical Westinghouse-designed plant operating at pH 6.9. Measured fuel cladding oxide thicknesses were somewhat greater than expected. Accordingly, Northeast Utilities limited exposure times at elevated lithium concentrations during cycle 3, by operating at a constant 3.35 ± 0.15 ppm lithium until the pH increased to 7.2, compared with the 7.4 noted for cycle 2. This reduces the time operating at 3.35 ppm lithium by about a factor of two.

Component dose rates measured after cycle 3 were about 15% lower than in plants operating under coordinated chemistry at a pH of 6.9. Oxide thickness data after cycle 3 operation with elevated lithium continued to be somewhat higher than found at other Westinghouse-designed plants operating at lower pH. Because of the high variability in oxide thickness measurements, it was concluded that the observations could not be definitively attributed to operation at elevated lithium concentrations. However, most plants using elevated lithium concentrations for extended periods show oxide thickness values greater than expected. A detailed analysis of the Millstone 3 and high burnup oxide thickness data from North Anna is in progress to see if the effect of operating at high lithium concentrations on fuel cladding oxidation can be more precisely determined.

Taken from "PWR Primary Water Coolant Chemistry: The View from the USA," Howard Ocken, Nuclear Engineering International, October 1992, p. 39.