N118. Putting pH 7.2 Water Chemistry To The Test At French PWRs

Tests are underway at six French PWRs to assess the benefits of switching to new primary water chemistry regime involving higher pH. Early results are encouraging, but it is still considered too early to come to any definitive conclusions.

In 1979, studies conducted in France by the CEA using the PACTOLE code showed that contamination by corrosion products would be significantly reduced by maintaining a pH_{300} level in the region of 7.0 (as calculated using the Marshall and Franck constant) throughout the cycle. EdF therefore decided, in agreement with Framatome, to apply this particular treatment to all its reactors (at the beginning of 1981). A limit was, however, also maintained on lithium concentration, with Li-7 kept in the range 0.6 ppm to 2.2 ppm inclusive, in keeping with the spirit of the original specification. Consequently, the pH_{300} is maintained constant at 7.0 for only the first two thirds of the cycle and then rises to 7.3.

On average, the *pH* level was 0.1 units higher than that Westinghouse was recommending at the time.

For the 28 900MWe reactors which used this treatment as from the time of initial commissioning, the dose rates are moderate, with a not unreasonable spread of values.

Moreover, very thin deposits (less than 1 micron) are encountered on the fuel elements. This chemical treatment is thus clearly satisfactory and is still applied in 44 reactors. Recent observations, particularly laboratory measurements of the solubility of nickel ferrites made in the U.S.A. (Westinghouse) and in France (CEA), showed that further reductions in contamination could be obtained with a "high pH" treatment. EdF then decided, in agreement with Framatome and CEA, to carry out a test at 6 PWR plants.

The following considerations applied to these tests:

- The pH_{300} of 7.2 would be kept constant within the limits of operating possibilities and in compliance with the upper limit for lithium concentrations, i.e., < 2.2 ppm.
- The test would probably have to be continued for three cycles in order to reach a conclusion.

The results in terms of dose rate are shown in the table, which shows that dose rates are reduced or have remained broadly similar for all the reactors under test except in one case where the dose rate in the steam generator channel heads has increased significantly.

Taken From: "Putting pH 7.2 Water Chemistry to the Test at French PWRs," Pierre Beslu, Alain Brissaud, and Pierre Saurin, p. 41-42, Nuclear Engineering International, April 1991.