

EVALUATION OF THE USE OF ZEOLITE MIXTURES IN THE SUBMERGED DEMINERALIZER SYSTEM (SDS) FLOWSHEET FOR DECONTAMINATION OF HIGH-ACTIVITY-LEVEL WATER AT THE THREE MILE ISLAND NUCLEAR POWER STATION, UNIT 2

L. J. King, D. O. Campbell, E. D. Collins, J. B. Knauer

Oak Ridge National Laboratory*
Oak Ridge, TN 37830

R. M. Wallace

Savannah River Laboratory
Aiken, SC 29801

Summary of paper for presentation at the Sixth International Zeolite Conference, Reno, Nevada, July 10-15, 1983

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* Operated by the Union Carbide Corporation under contract W-7405-eng-26 with the U.S. Department of Energy.

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Mixtures of Linde Ionsiv™ IE-96 and Linde Ionsiv™ A-51 were evaluated for use in the Submerged Demineralizer System (SDS) that was installed at the Three Mile Island Nuclear Power Station, Unit 2 (TMI-2) for decontaminating ~2650 m³ of high-activity-level water (HALW) in the Containment Building (CB) sump.

In the original SDS process flowsheet, the cesium and strontium were to be sorbed on Linde Ionsiv™ IE-96. The 225-L (60-gal), modular, ion-exchange columns were to be changed after treatment of 200 bed volumes of HALW. The cesium loading would have been 10,000 Ci/column, and 60 columns would have been required.

A Department of Energy SDS task force determined that it was economically desirable and technically feasible to increase the cesium loading in the SDS to 60,000 Ci/column and collect the cesium on ten columns. However, because of the lower affinity of Linde Ionsiv™ IE-96 for strontium, an additional 17 columns would be required to sorb the remainder of the strontium. The only way to reduce the total number of columns required was to increase the strontium capacity by using a more strontium-selective sorbent. Linde

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Ionsiv™ A-51 was not considered in the original flowsheet because it has very little capacity for cesium; however, the A-51 was proposed for use in conjunction with IE-96 to balance the sorption of cesium and strontium.

Tracer-level tests were made using simulated TMI-2 CB sump water to determine strontium distribution coefficient values for A-51 zeolite and to determine the performance characteristics of mixtures of IE-96 and A-51 zeolites. A hot-cell test using a 3-L sample of TMI-2 CB sump water was made to verify the tracer-level tests. These tests indicated that mixtures of IE-96 and A-51 zeolites could be tailored to balance the sorption of cesium and strontium from the CB sump water.

The use of a zeolite mixture of 60% Linde Ionsiv™ IE-96 and 40% Linde Ionsiv™ A-51 was recommended for the SDS. Calculations indicated that all of the sump water (2650 m^3) could be treated using only ten, 225-L (60-gal) mixed-zeolite, ion-exchange columns instead of the 27 columns that would have been required if only the IE-96 zeolite was used.