

**PROCESSING TRITIATED WATER AT THE SAVANNAH RIVER SITE:  
A PRODUCTION-SCALE DEMONSTRATION OF A PALLADIUM MEMBRANE  
REACTOR**

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The Palladium Membrane Reactor (PMR) process was installed in the Tritium Facilities at the Savannah River Site to perform a production-scale demonstration for the recovery of tritium from tritiated water adsorbed on molecular sieve (zeolite). Unlike the current recovery process that utilizes magnesium, the PMR offers a means to process tritiated water in a more cost effective and environmentally friendly manner. The design and installation of the large-scale PMR process was part of a collaborative effort between the Savannah River Site and Los Alamos National Laboratory.

The PMR process operated at the Savannah River Site between May 2001 and April 2003. During the initial phase of operation the PMR processed thirty-four kilograms of tritiated water from the Princeton Plasma Physics Laboratory. The water was processed in fifteen separate batches to yield approximately 34,400 liters (STP) of hydrogen isotopes. Each batch consisted of round-the-clock operations for approximately nine days. In April 2003 the reactor's palladium-silver membrane ruptured resulting in the shutdown of the PMR process. Reactor performance, process performance and operating experiences have been evaluated and documented. A performance comparison between PMR and current magnesium process is also documented.