

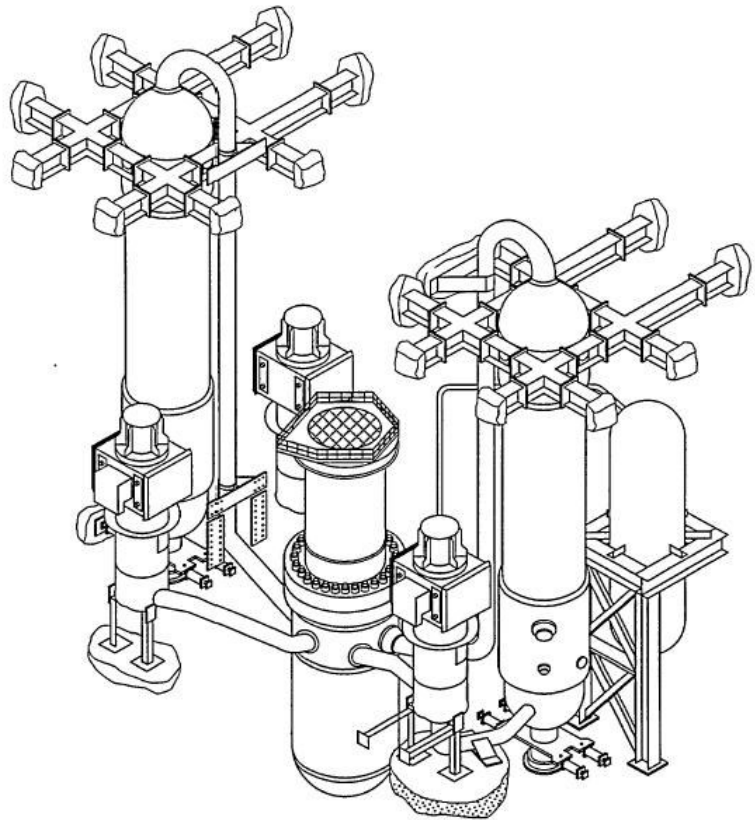


Union of Concerned Scientists

Citizens and Scientists for Environmental Solutions

Davis-Besse: Leaking Reactor Coolant Pump Gaskets

The Davis-Besse nuclear plant in Ohio features a pressurized water reactor (PWR) designed by the Babcock & Wilcox (B&W) Company. The B&W PWR has a reactor pressure vessel linked by piping to two steam generators. Two reactor coolant pumps (RCPs) take water from the reactor pressure vessel and send it through one steam generator. Piping at the top of the steam generator (commonly called the “candy cane” due to its shape) returns the water to the reactor pressure vessel. The B&W PWR thus has four reactor coolant pumps, two on each of the two steam generator loops. This configuration is represented in the 3-D schematic to the right. One of the reactor coolant pumps is hidden behind a steam generator with the sole pressurizer to its right.



On August 9, 2002, J. Barron, the Supervisor of Equipment Reliability at Davis-Besse, and J. B. Cummings, the Supervisor of Mechanical Systems, sent a six-page memo to J. W. Rogers, the Manager of Plant Engineering. Barron and Cummings recommended that the gaskets on all four reactor coolant pumps be replaced and the impellers on all four reactor coolant pumps be inspected and repaired/replaced as necessary. Barron and Cummings reported that:

- “All four reactor coolant pumps had indications of pump casing gasket leakage at the inner gasket.”
- “Leakage has been reported from the inner gasket for all 4 RCPs in 11 RFO.”
- “12 RFO, DB-PF-03035 indicated leakage from the inner gasket area for RCP 1-1, 1-2, and 2-1. No external leakage was indicated. The leakage test on RCP 2-2 was indeterminate.”
- “13 RFO, DB-PF-03035 indicates leakage from the inner gasket area for RCP 1-2 and 1-2. No external leakage was found. RCP 2-1 and 2-2 leak tests were not performed.”
- “FLOWERVE does not recommend operating for extended periods (multiple cycles) with the inner seal leaking thus relying solely on the outer seal.”
- “Two of the RCPs have had leakage past both gasket areas and boron deposits on the pump casing bolts.”
- “Re-tensioning of the studs on all RCPs was performed in 10RFO when leakage was found.”
- “The tensioning of the cover bolts has not completely stopped the leakage.”

- “Primary leakage was found on the inner seal during 11RFO and we have operated with known leakage on the inner seal since then.”

FirstEnergy had contacted FLOWSERVE earlier in the summer of 2002 regarding the reactor coolant pump gaskets. By letter dated July 2, 2002, FLOWSERVE informed FirstEnergy that:

- “The specification for allowable leakage is zero. Any leakage will require pump disassembly and gasket replacement to restore joint tightness.”

Barron and Cummings cited the input from FLOWSERVE in justifying their recommendation to replace the gaskets on all four reactor coolant pumps. Barron and Cummings reported another reason for wanting to disassemble all four reactor coolant pumps at Davis-Besse:

- “FLOWSERVE has identified the potential for cracks forming in the impeller vanes. The cracks are caused by inadequate heat treatments of repairs during manufacturing and are propagated by stops/starts of the pumps. Investigation has found that all four of the installed impellers have had weld repairs without heat treatment.”

So, leaking inner gaskets on all four reactor coolant pumps and potential degradation of the impeller vanes on all four reactor coolant pumps prompted Barron and Cummings to recommend action be taken prior to restart.

And action was indeed taken. Reactor coolant pumps 1-1 and 1-2 were disassembled. Their leaking gaskets were replaced. The pump shaft on RCP 1-1 was found cracked, necessitating its replacement under Work Order 02-004137-005 with a spare shaft procured from the Crystal River nuclear plant in Florida.

But reactor coolant pumps 2-1 and 2-2 were not disassembled. Their leaking gaskets were not replaced. Their potentially degraded impeller shafts were not inspected. Their pumps shafts were not examined for cracks.

FirstEnergy intends to restart Davis-Besse knowing that half of its reactor coolant pumps have degraded inner gaskets. During the pressure test of the reactor coolant system, this degradation can be covered up by simply not opening two normally closed valves in the piping that carries water leaking past the gaskets to the sump. With these valves closed, water leaking past the inner gasket stays “bottled up” until the outer gasket fails. What happens when borated water leaks past the outer gasket? Quoting Barron and Cummings again:

- “OE 12074, TMI 1, had indications of an inter-gasket leak 1993, and in 1999 found approximately 1000 pounds of boric acid on a RC-P-1P. 14 of the 24 RCP stud bolts were covered with boron, causing severe wastage on several stud bolts.”
- “SOER 81-012 described three facilities, Fort Calhoun, Oconee 2, and Oconee 3 that did not monitor leakage past the first sealing surface until leakage occurred out of the pump cover damaging studs and surrounding equipment.”

The NRC must not let Davis-Besse restart with leaking inner gaskets and potentially degraded impellers on reactor coolant pumps 2-1 and 2-2. And the NRC won't permit it – unless FirstEnergy asks.

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