

FLOWSERVE

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2 July 2002

First Energy Nuclear Operating Co. Davis Besse Nuclear Station
Attn: Mr. Andrew Siemaszko

Subject: Reactor Coolant Pump Inter Gasket Leakoff

The Byron Jackson DFSS model reactor coolant pump, which operates in PWR reactor systems, is designed with a double gasket for closure of the main case-to-cover joint. The annulus between the two flexitallic-style gaskets is connected through a high-pressure line to an isolation valve. The purpose of this inter-gasket leakoff line is to capture any leakage past the inner gasket and to allow monitoring of potential leakage. Each gasket and the inter-gasket leakoff line and valve are designed to withstand full system pressure.

Slight leakage past the inner gasket has occurred on some RCP's, usually during thermal transients. There is a temperature profile across the large components such as the case and cover. The resulting deflection of the sealing surfaces can result in leakage. In most cases, if the leakage is low, the joint will close up when operating temperature is achieved. In this condition, the inter-gasket leakoff line would be shut and monitored as practical during startup. As long as the outer gasket can provide a tight seal, the inter-gasket leakoff valve can be shut. The inner gasket may degrade to a point at which the outer gasket begins to leak during thermal transients. In this condition, the intergasket leakoff line should be opened during thermal transients to preserve the integrity of the outer gasket.

The specification for allowable leakage is zero. Any leakage will require pump disassembly and gasket replacement to restore joint tightness. The damage resulting from slight leakage during thermal transients is moderate, as long as the leakage arrests during steady-state operation. A steady-state operation leak indicates high degradation and increased leakage can be expected.

Based on industry experience, once the inner gasket begins to experience leakage, there is little chance of restoring full integrity of the case-to-cover joint without pump disassembly. There have been attempts to eliminate leakage by retensioning the case studs. Retensioning of case studs while the motor is installed is very difficult and time-consuming and from experience is marginally effective. Even in cases where the stud preload has been lower than required, retensioning was not successful in stopping the leakage. Once there has been degradation of the gasket, the sealing ability is compromised and there will most likely be continued leakage problems.

Flowserve recommends that the pump gasket degradation be addressed as part of a comprehensive pump inspection/refurbishment plan. The installation of the improved inconel flexitallic gasket and use of proper stud tensioning techniques has been successful in restoring joint integrity. There are significant issues of shaft bowing and impeller cracking that need be evaluated for the operating equipment and for potential reuse of used components. The inspection and refurbishment of components has been a successful long-term strategy for several PWR plants with BJ reactor coolant pumps. Please contact me at glenzen@flowserve.com or 320-267-4831 if more information is required.

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