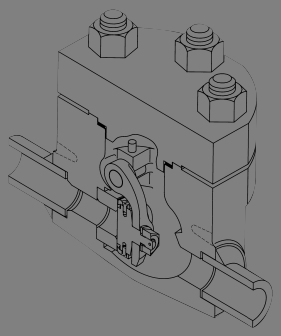

Auxiliary Feedwater Check Valve Problems

FCD ADAMS8029-01

Check valves are installed between the auxiliary feedpumps and the steam generators (or in some plants, the main feedwater system) in order to prevent backflow into the auxiliary feedwater system when it is not in use or when a pump is out of service. In addition, check valves are installed in the crossties between the parallel trains of the auxiliary feedwater system, in order to prevent backflow through any of the trains should a pump become inoperable. Lack of a thorough understanding of system interactions and check valve dynamics led most systems engineers to specify swing check valves as the original equipment in these systems.

As plants gained operating experience, these valves quickly became a source of both maintenance and operating problems. The problems became so severe that eventually an I&E Bulletin was issued to bring operator attention to the situation.

In that Flowserve Anchor/Darling Valves had supplied most of the original equipment, we had been fully aware of the problem and had been working on a solution. The first of the new generation of Anchor/Darling auxiliary feedwater check valves have been in service for over seven years now and continue to provide trouble-free service.

The problem with the original valves occurred in two areas: seat leakage and premature hinge support wear. Hinge support wear is a common problem with swing check valves that are installed in systems with low flows. Swing check valves need a minimum flow in order to keep the disc fully open. If the valve frequently experiences lower flow rates, the disc is buffeted and is in constant motion between the seat and a partially open position. This leads to seat damage and wear of the hinge support.

Although the maximum design flow for the auxiliary feedwater system is more than sufficient to keep the valves fully open, other system operating modes do not produce sufficient velocities. For example, the auxiliary feedwater system is frequently used to supply coolant to the steam generator during startup. In this mode, flow through these valves is barely enough to raise the disc off the seat.

The seat leakage problems resulted from two separate phenomenon. The seat damage mentioned above was a major contributor, and the second factor was the lack of a large differential pressure across the valve. All valves, but especially check valves, rely on differential pressure for a sealing force. Small differences in upstream and downstream pressures will generally result in some seat leakage in a metal-seated valve regardless of the condition of the sealing surfaces.

In many applications, some seat leakage is acceptable. In this service, unfortunately, the leakage past the valves caused the auxiliary feedpumps to become “steam bound” and, therefore, inoperable.

Anchor/Darling’s search for a solution led to the development of a group of valves specifically designed for this service. In order to eliminate hinge wear problems, Anchor/Darling opted to replace the swing checks with valves that exhibited disc stability through a much wider range of flow conditions. Both tilting-disc check and lift check valves provide greater disc stability at low flows. Both types of valves have been used successfully in this application. The choice

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Anchor/Darling Valves

as to which one is best suited for a particular plant is determined by a thorough evaluation of the system's unique operating conditions.

Although the elimination of seat damage, through the use of a more suitable valve, was predicted to minimize the seat leakage (and thus the steam binding problem) some plant operators wanted additional assurance of seat tightness. Anchor/Darling recommended the use of our "Soft Seat" APEX seal design to provide this added protection.

Valves of both body types, with and without soft seats, have been installed in numerous operating plants and have years of trouble-free operation behind them. This is but another example of the type of improvement that is continuously being made through the joint efforts of plant operators and Flowserve Anchor/Darling Valves.

Experience List

Plant	Valve Size	Body Type	Seat Design
Oconee	4" 900#	Tilt-Disc	Soft Seat
Robinson	4" 900#	Tilt-Disc	Metal Seat
Harris	4" 900#	Tilt-Disc	Metal Seat
Turkey Point	4" 900#	Tilt-Disc	Metal Seat
McGuire	4" 900#	Tilt-Disc	Soft Seat
Catawba	4" 900#	Tilt-Disc	Metal Seat
Farley	4" 900#	Tilt-Disc	Metal Seat
Point Beach	4" 900#	Lift Check	Metal Seat

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(Part 00000)

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