

REPORT NUMBER: AO-50-265/75-9

REPORT DATE: March 20, 1975

OCCURRENCE DATE: March 14, 1975

FACILITY: Quad-Cities Nuclear Power Station
Cordova, IL 61242

IDENTIFICATION OF OCCURRENCE:

Main steam isolation valve (MSIV) local leak rate testing revealed excessive leakage through MSIV 2-203-2A.

CONDITIONS PRIOR TO OCCURRENCE:

Unit 2 was in cold shutdown for reactor refueling.

DESCRIPTION OF OCCURRENCE:

On March 14, 1975, local leak rate testing was being performed on the Unit Two Main Steam Isolation valves on line "A". Prior to the test, the MSIV's were placed in the closed position from the control room.

The leakage measurements were obtained by pressurizing the volume enclosed by the inboard and outboard MSIV's through a pressure test connection to a pressure of 25 psig. This yielded a combined two valve (inboard and outboard) leakage of 259.0 scfh.

Because the inboard MSIV 2-203-1A was repaired on February 2, 1975, the outboard MSIV-2-203-2A was suspected of leaking excessively. This fact was verified by raising the water level upstream of MSIV 2-203-1A, then pressurizing the volume between the inboard and outboard MSIVs. Work request no. 879-75 was immediately initiated to repair the outboard MSIV 2-203-2A.

Valve 1A showed an acceptable leakage value, but 2A exceeded the Technical Specification limitation of 11.5 scfh for any one MSIV.

DESIGNATION OF APPARENT CAUSE OF OCCURRENCE:

Upon disassembly of valve AO 2-203-2A, washing of the valve seat was observed. Uneven heating produces a small warpage which eventually leads to a slight erosion of the stellite material. It is this slight amount of expected warpage which resulted in an inability to drain the volume enclosed by the MSIVs of the "A" steamline.

ANALYSIS OF OCCURRENCE:

In the event of a main steam line break outside the primary containment, the total leakage possible through the "A" steam line would have been 129.5 scfh.

The excessive leakage rates did not in any way render the MSIVs inoperable, nor was the ability of the valves to perform their design function affected. Upon receipt of a Group I isolation signal, these valves would have shut in the required time, and performed the isolation function.

The Main Steam Isolation Valves utilize straight line flow to provide a good flow pattern and upstream side of the valve. The balancing feature of the valve makes it possible to take advantage of the upstream pressure to aid in holding the valve closed and to have the advantage of requiring a small actuator cylinder to open the valve. This is accomplished by allowing the full upstream line pressure to bleed into the chamber above the plug through the balancing part to exert a force on the plug internals in a direction to hold it against the seat.

This design, combined with the fact that the MSIVs are open during normal operation, minimizes the safety implications of this occurrence.

CORRECTIVE ACTION:

Valve A0 2-203-2A was disassembled and machined to eliminate the slight warpage which was present. Following reassembly of the valve, the local leak rate test revealed a leakage of 0.0 scfh.

FAILURE DATA:

Main Steam Isolation Valve A0 2-203-2A had not been individually leak rate tested since the pre-operational tests in 1971. The combined leakage of the 1A and 2A valves of the "A" steam line was found to be 1.4 scfh at that time.

Unit two MSIVs 2-203-1B and 2B were leak rate tested on April 27, 1974, during an investigation of missing parts on electromatic relief valve 2-203-3E. The measured leakage was 52.4 scfh, and repairs were initiated. In that case, the inboard valve had two deep gashes on the pilot stem which were the main cause of the leakage. The pilot stems were machined and the seats lapped on both valves. A subsequent leak rate test was performed and the measured leakage was 3.25 scfh.

The Unit One MSIVs were leak rate tested on April 1, 1974 with valves A0 1-203-2C, 1D and 2D indicating leak rates of 216.0 scfh, 34.7 scfh, respectively. Upon disassembly of these valves, minor surface defects were noted on the main valve pilot stems. The pilot stem surfaces on valves 1D and 2D showed significantly less defects than did the 2C valve.

A Crane Valve Company representative was present during the valve repairs. The cause of the leakage was attributed to these surface defects. It is postulated that hard valve closure during Group I isolation conditions may have caused the main pilot stem surfaces to become defective.

The main valve seating surfaces were closely examined and no excessive corrosion or surface marks were observed. Therefore, it was determined that the major cause of the excessive leakages on the three main steam isolation valves was the presence of surface defects on the valve pilot stems. Subsequent leak rate tests resulted in leakages of 8.64 scfh, 5.76 scfh and 0.0 scfh respectively for valves A0 1-203-2C, 1D and 2D.