PDR 83

ACTION PLAN # 16

TITLE: REPORT ON MAIN STEAM HEADER PRESSURE

REV	DATE	REASON FOR REVISION	BY	CHAIRMAN TASK FORCE	APPR. FOR IMPL.
0	6/25/85	Initial Issue	L. Huston		

TITLE: June 9, 1985 Trip, Report on Main Steam Header Pressure

REPORT BY: L. L. Huston PLAN NO.: 16

DATE PREPARED: June 25, 1985 PAGE 1 OF 4

INTRODUCTION:

This report has been prepared in accordance with the "Guidelines to Follow When Troubleshooting or Performing Investigative Actions into the Root Causes Surrounding the June 9, 1985 Reactor Trip", Rev. 4.

This report addresses main steam system and steam generator pressure control during and subsequent to the June 9, 1985 reactor trip transient. Erratic pressure control was experienced in both main steam headers. Possible operational and equipment problems associated with the main steam safety valves (MSSVs), atmospheric vent valves (AVVs), and associated AVV controls are discussed below.

The following organizations were contacted during preparation of this report and the associated action plan.

- Dresser Industries - MSSV vendor (included service personnel experienced with Davis-Besse MSSVs)
- Control Components Inc. - AVV vendor (including service personnel experienced with Davis-Besse AVVs)
- Joyner Engineers and Trainers - Design experience with Integrated Control System (ICS)
- Babcock & Wilcox Company - Nuclear Steam System Supplier (Mechanical Equipment Division and Field Services)

SUMMARY OF DATA:

Background

Davis-Besse has experienced several occurrences of individual MSSV blowdowns which exceed Dresser design ratings for these valves (i.e., After lifting to relieve an overpressure condition, a MSSV may reseat at a pressure lower than the intended setpoint. The valves are adjusted for approximately three percent blowdown.) Ring settings were modified as a result of blowdown testing at Wylie Labs in 1979. This has improved valve performance. Excessive blowdown of a MSSV can result in larger than desirable cooldown rates of the Reactor Coolant System (RCS) via the steam generators and possible loss of pressure control in the RCS.

As a result of this experience with excessive MSSV blowdown, the Davis-Besse operators use the turbine bypass valves (TBVs) and AVVs to control steam header pressure below MSSV setpoint to preclude MSSV actuation. In the case of the June 9, 1985 reactor trip discussed further below, the AVVs were used for pressure control since the Main Steam Isolation Valves (MSIVs) were closed (the TBVs are downstream of the MSIVs).

Experience during previous trips has generally not shown large pressure swings such as were experienced during the June 9, 1985 trip transient.

Significant conditions prior to the trip for purposes of this analysis include:

On June 2, 1985 following a plant trip, Operations personnel reported an unusually loud and rapid cycling noise which was considered to be due to MSSV actuations. As a result, visual inspections of all MSSVs were performed by Toledo Edison personnel.

All 18 valves appeared to have opened during the plant trip as indicated by missing canvas exhaust hoods (used to prevent cold air from entering MSSV stacks and indicate valve operation). Based on visual examination, the valves appeared in normal physical condition. However, MSSVs A1, A3, B1, B2, B3, B4, and B8 were found to be leaking slightly. This leakage was judged not to impair proper MSSV operation. The #1 AVV was also found to be leaking.

June 9, 1985 Trip

On June 9, 1985, the reactor plant was operating in Mode 1 with a steam pressure of about 860 psig, with ICS in automatic and Main Feedwater Pump No. 2 in manual. The AVVs were closed as normal for this operating condition.

After the reactor trip at 1:35:29, all MSSVs are judged to have lifted, based on observation that all canvas exhaust hoods were missing. Subsequent to the trip, repeated lifts of one or more MSSVs on each header were experienced intermittently for several minutes resulting in pressure swings of approximately 50 psi. In addition, there were several periods when steam header pressure swung over 100 to 250 psi for several minutes. This is not expected for header pressure control when using the AVVs.

MAINTENANCE AND SURVEILLANCE/TESTING HISTORY:

1. There have been several occurrences of MSSV blowdown in excess of rated 3%. Prior to the 1984 refueling outage, reseat pressure experienced during recent plant trips ranged from approximately 980 to 900 psig.

2. In March 1984, the A4 MSSV stuck open after a reactor trip resulting in boiling dry steam generator 1-2. The root cause of this occurrence was failure of a cotter pin permitting the release nut to travel unrestricted down the spindle threads. Maintenance Procedure 1401.28 has been revised to require installation of new stainless steel cotter pins when maintenance is performed on a MSSV.

3. Previous maintenance experience on MSSVs has shown:

   a) Excessive wear of guides and holders
   b) Bending of spindles
   c) Damage to the disc seats requiring replacement
   d) Greater maintenance requirements for the low set pressure MSSVs.

4. All MSSVs on the No. 2 ("A") header were rebuilt during the 1984 refueling outage. Valve B2 was rebuilt in March 1985. Valves B1 and B7 were rebuilt in 1983, and the other valves on the B header were last rebuilt in 1982.

5. Four of the eighteen installed MSSVs have a smaller capacity ("Q" orifice). These valves have required considerably less maintenance than the large ("R") orifice MSSVs.

6. Both AVVs were rebuilt during the 1984/85 refueling outage.

7. Recent maintenance and testing histories of the MSSVs, AVVS, and Integrated Control System were reviewed. Nothing of significance was noted.

CHANGE ANALYSIS:

There have been no known changes to the MSSVs or AVVs since the refueling outage with the exception of rebuilding MSSV B2 on March 25, 1985. The only activity regarding these components was normal maintenance and testing as delineated above.

HYPOTHESES:

The large pressure swings experienced on both steam headers may be due to:

Hypothesis #1:

Manual control of the AVVs by the reactor operator. The reactor operator does recall periods of manual control, but not specific times. The pressure swings are larger than desirable or expected for proper manual control of the AVVs.

Hypothesis #2:

The Atmospheric Vent Valves were kept in automatic and controlled at the header pressure dialed by the operator. However, automatic pressure control was then lost intermittently, due to malfunctioning Integrated Control System circuitry and associated hardware. This allowed the Atmospheric Vent Valves to remain open except when controlled by SFRCS or closed manually. Note that actual set pressure dialed by the operator is not recorded. It appears that there were periods when adequate automatic control was maintained.

Hypothesis #3:

Extended blowdown of one or more safety valves on each steam header. This is not expected to be the cause of all observed pressure swings since some were apparently terminated at the same point in time as closure of the AVVs (i.e., when low pressure SFRCS actuation occurred).

Hypothesis #4:

The pressure drops were due to steam flow past the Main Steam Isolation Valves (MSIV). This hypothesis is not considered viable as computer points Z683 and Z686 show MSIVs 1 and 2 to close at 1:35:36 and 1:35:37 and remain closed for several hours. (MSIV 1 was reopened at 6:42:32 and MSIV 2 was reopened at 6:42:56.) It is noted that the Turbine Bypass Valves were closed, isolating the flow path downstream of the MSIV. These steam lines downstream of the MSIVs were also observed to drop in temperature.

Hypothesis #5:

Operating conditions (such as header vibration) contribute to low reseating of safety va ves and accelerated degradation of valve components. This degradation contributes to or causes excessive blowdown on one or more main steam sa ety valves.

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DATE PREPARED	PREPARED BY
6/26/85	L. Huston

TITLE

REPORT ON MAIN STEAM HEADER PRESSURE (Rev. 0)

SPECIFIC OBJECTIVE

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
	ALL STEPS ON THIS ACTION PLAN ARE TO BE PERFORMED IN ACCORDANCE					
	WITH THE LATEST REVISION OF "GUIDELINES TO FOLLOW WHEN TROUBLE-					
	SHOOTING OR PERFORMING INVESTIGATIVE ACTIONS INTO THE ROOT					
	CAUSES SURROUNDING THE JUNE 9, 1985 TRIP".					
	ALL WORK PERFORMED UNDER THIS ACTION PLAN IS TO BE WITNESSED					
	BY LARRY HUSTON OR DESIGNATED SUPPORT PERSONNEL.					
1	Prior to any work of either an investigatory or troubleshooting	L. Huston				
	nature, any unusual, unexpected or abnormal as-found conditions					
	are to be documented, including photographs where necessary.					
2	Perform a stroke test of the Atmospheric Vent Valves (AVVs) in	L. Huston	P. Mahoney			
	in Mode 3, with steam pressure under the valve. This is to be		J. O'Neill			
	performed locally from the Control Room using the hand/auto					
	station.					
3	Ensure proper functioning of alarm points Z961 and Z969 that	L. Huston	J. DeSando			
	provide position status of AVVs.		K. Yarger			
			J. Narus			

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SPECIFIC OBJECTIVE

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
4	a. Perform a string check of ICS modules providing automatic	L. Huston	J. DeSando			
	control of the AVVs. Any modules in this string found to		K. Yarger			
	be out of order are then to be bench tested.		J. Narus			
	b. Check proper operation of the hand/auto station in the					
	Control Room.					
	c. Check calibration of "dialed in" pressure control.					
	d. Check the ICS to ensure the 145 psi bias is still maintained.					
	e. Perform operability and calibration check of steam header					
	pressure transmitters.					
	Assistance from L. Joyner is expected with Step 4.					
*5	Perform internal inspection of selected MSSVs per Maintenance	P. Mahoney	J. O'Neill			
	Procedure 1401.28, "MSSV Disassembly, Inspection/Repair and		L. Huston			
	Reassembly". This will include recording results of visual					
	inspections, dimensional checks, and ring settings. Vendor					
	engineering & service representatives will provide assistance.					

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REPORT ON MAIN STEAM HEADER PRESSURE (Rev. 0)

SPECIFIC OBJECTIVE

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
*6	Evaluate whether steam testing of selected valves should be performed, and perform as required.	L. Huston	P. Mahoney T. Hiss J. O'Neill			
*7	If root cause is not found through above steps, develop program for monitoring and analyzing operating conditions which could be contributing to accelerated degradation.	L. Huston	T. Hiss P. Mahoney D. Wilczynski			
*	Steps 5, 6, & 7 may be performed in any sequence.					