



RALPH A. HILLER COMPANY
6005 ENTERPRISE DRIVE EXPORT, PA 15632

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October 29, 1998

Document Control Desk
United States Nuclear Regulatory Commission
Washington, DC 20555

Reference: Hiller Document 98-NRC-003

Dear Sir,

Per the applicable requirements of Title 10, Chapter 1, Part 21 of the Code of Federal Regulations, the responsible officer for the Ralph A. Hiller Company I advised the Nuclear Regulatory Commission of a possible defect in a letter dated May 19, 1998 (Attachment A).

As required by 10CFR21, I will be submitting a full, final report, which will indicate whether a reportable defect exists or not. However, at this time we are currently proceeding with a final examination of which we feel is required to accurately determine the root cause of the cracked piston. I expect the testing, analysis and the report to be complete and the determination to be completed within the next sixty- (60) days.

Should you have any questions, you can reach me at (724) 325-1200, or fax me at (724) 733-1825.

Thank you for your attention in this matter.

Yours truly,

J. Randolph Hiller
Chief Executive Officer

Attachments: (1) "Notice of Possible Defect per 10CFR21"

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RALPH A. HILLER COMPANY
6005 ENTERPRISE DRIVE EXPORT, PA 15632

TELE: 412 325-1200
FAX: 412 733-1825

May 18, 1998

Document Control Desk
United States Nuclear Regulatory Commission
Washington, DC 20555

Reference: Hiller Document 98-NRC-001

Dear Sir,

Per the applicable requirements of Title 10, Chapter 1, Part 21 of the Code of Federal Regulations, it is my responsibility as the responsible officer for the Ralph A. Hiller Company to advise the Nuclear Regulatory Commission of the attached "Possible Defect".

As required by 10CFR21, I will be submitting a full, final report, which will indicate if a reportable defect exist or not.

Should you have any questions, you can reach me at (724) 325-1200, or fax me at (724) 733-1825.

Thank you for your attention in this matter.

Yours truly,

J. Randolph Hiller
Chief Executive Officer

Attachments: (1) "Notice of Possible Defect per 10CFR21"

cc: file

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RALPH A. HILLER COMPANY
6005 ENTERPRISE DRIVE EXPORT, PA 15632

TELE: 412 325-1200
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Attachment 1 "Notice of Possible Defect per 10CFR21"

Background

The Ralph A. Hiller Company of Export PA is a supplier of safety related components to Nuclear Power Plants with a Quality Assurance Program per the requirements of Title 10, Chapter 1, Part 21 of the Code of Federal Regulations. A significant portion of these components has been valve actuators.

Description of Event

IES Utilities Inc., Duane Arnold has reported that a Model SA-A101 Main Steam Isolation Valve "A" (MSIV) Actuator showed evidence of internal leakage, in both directions past the pneumatic piston. The actuator was returned to the Hiller Company's production facility for evaluation. Evaluation verified the excessive leakage and discovered a fracture of the pneumatic piston. The crack consisted of a cross sectional (through) crack in the web and reinforcement ribs at the center hub involving a $\geq 180^\circ$ on the hub area circumference.

Engineering Background

The Model SA-A101 MSIV Actuator is a Basic Component, which has been classified as safety related. It consists of a 20" diameter bore pneumatic cylinder in tandem with a 5" diameter bore hydraulic cylinder. The failure (safety) mode is the rod extended (valve closed) position. This position is achieved via an external spring pack and is assisted by the pneumatic portion. The hydraulic cylinder is designed for speed control. This family of actuator is used as the MSIV Actuator at many other plants.

The actuators designed by the Hiller Company for safety related applications are designed per the guidelines of ANSI B93.10. The piston material is designed to be ASTM A48 cast iron with a tensile yield strength of 35,000 PSI. This material was chosen for its excellent compressive strength, good tensile strength, good machinability, and excellent resistance to gauling characteristics and is extensively used for pneumatic industry applications. However, the material does not have good bending strength.

When the Model SA-A101 MSIV Actuators were purchased in 1989/90 by Duane Arnold, the production verification of the pistons for safety related service were programmatically required to be dimensionally checked, assembled, the correct assembly was verified and finally a leak test was required. Our records indicate each of these verifications was successfully performed.

Investigation

The failed piston was tested to verify the material and failure mode. The failure was found to be caused by bending stresses due to impact. The material was found to be cast iron with a tensile yield strength of 27,500 PSI. No inclusions were found which would initiate this type of fracture. No other indications of damage were found in the remainder of the actuator that could cause leakage.

Inspection of other MSIV Model SA-A101 MSIV Actuators, which have been in service at Duane Arnold, found another with a similar, less severe crack, actuator "B". This actuator, "B", had been in service on the same Main Steam Line at the plant. The piston web was cracked in the same area, however the crack did not propagate through the part and no leakage was detected. As part of IES's maintenance plan, both

Actuators "A" & "B" had been refurbished and postproduction tested a second time approximately two years ago with no leakage.

Review of the exact nature of these failures indicated that the safety function of the actuator would not have been prevented, even if the fracture had been catastrophic and the piston had become loose from the piston rod. The piston failed safely and would not have prevented the safety mode from occurring, produced by compressed air and springs. Further testing on actuator "B" indicated that normal cycling of the actuator did not continue to propagate the failure.

Discussions with the owner, IES Utilities Inc and the plant designer, General Electric, indicate that operationally there is a standard test, which could create a pressure anomaly through the line. Discussions with the valve manufacturer, Edwards Valves, concluded this type of event could cause the valve to force the Actuator's piston rod into the Actuator (retract). The initiating event is still under investigation. The hydraulic control system is not designed to mitigate shock waves that produce excessive internal hydraulic pressures. The excessive energy could cause damage of the pneumatic piston and/or the hydraulic control assembly. The original specification did not require that the Actuator to be designed for this type of event and there has not been a similar reported failure of a piston on any actuator designed by the Hiller Company.

Plan

The Ralph A. Hiller Company is currently working to determine the cause and extent of the problem. This work requires a more thorough engineering review of the function of the MSIV Actuator in the plant and the stresses this could create in the piston. Per the applicable portions of the Ralph A. Hiller Company's Quality Assurance Program and 10CFR21 the findings of this investigation along with any recommendations will be reported to the Nuclear Regulatory Commission.

Summary

There has been a crack found in two pistons, of two of the MSIV Actuators, in service at a single Nuclear Power Plant. A loss of function of the actuator did not occur. These actuators were on the same Main Steam Line and it has been determined that the leaking piston would not have prevented the safe function of the basic component. At this point in time, the situation is being reviewed to determine if this failure could pose a "substantial safety hazard" to the particular, or any other Nuclear Power Plant.