

PHILADELPHIA ELECTRIC COMPANY

2301 MARKET STREET

P.O. BOX 8699

PHILADELPHIA, PA. 19101

(215) 841-4502

S. J. KOWALSKI  
VICE-PRESIDENT  
ENGINEERING AND RESEARCH

SEP 18 1987

Mr. W. T. Russell, Administrator  
U.S. Nuclear Regulatory Commission, Region I  
Attention: Document Control Desk  
Washington, DC 20555

Docket No. 50-353

Subject: Limerick Generating Station Unit 2  
Significant Deficiency Evaluation No. 213-2  
Pacific Scientific Mechanical Shock Suppressors  
with High Acceleration Values

Reference: Telecon, P. K. Pavlides to H. Williams (USNRC),  
dated August 19, 1987


File: QUAL 2-10-2 SDR No. 213

Dear Mr. Russell:

In compliance with 10CFR50.55(e), we are submitting our final Significant Deficiency Report concerning the subject high acceleration values for PSA-10 size snubbers.

We trust that this satisfactorily resolves the item. If further information is required, please do not hesitate to contact us.

Sincerely,




KAH/pd09088707

Copy to: Mr. W. T. Russell, Administrator  
U.S. Nuclear Regulatory Commission, Region I  
631 Park Ave.  
King of Prussia, PA 19406

Mr. E. M. Kelly, Senior Resident Inspector  
U.S. Nuclear Regulatory Commission  
P. O. Box 46  
Sanatoga, PA 19464

8802250317 870918  
PDR ADOCK 05000353  
S DCD

IE27  


PHILADELPHIA ELECTRIC COMPANY  
MECHANICAL ENGINEERING DIVISION  
N2-1 - 2301 Market Street

SIGNIFICANT DEFICIENCY EVALUATION - SDR NO. 213-2  
PACIFIC SCIENTIFIC MECHANICAL SHOCK SUPPRESSORS  
LIMERICK GENERATING STATION UNIT 2  
NRC CONSTRUCTION PERMIT NO. CPPR-107  
DOCKET NO.50-353

INTRODUCTION:

This significant deficiency evaluation provides information on Pacific Scientific mechanical shock suppressors (snubbers), size PSA-10, for which test results show activation acceleration values greater than the manufacturer's design limit (0.02g). The cause of these high acceleration values is excessive greasing of internal components. In the case of an earthquake or other design basis dynamic event snubbers are called upon to limit piping and component displacement and thereby mitigate the consequences of the event.

This deficiency was reported via telecon to H. Williams, USNRC Region I, by P. K. Pavlides on August 19, 1987.

BACKGROUND:

Pacific Scientific snubbers are designed to limit the acceleration of piping and attached components to less than 0.02g. Acceleration values in excess of 0.02g are acceptable where justified by a case specific analysis. If a dynamic event accelerates a pipe or component, a restraining force is applied by the snubber which limits the acceleration to less than 0.02g. The snubber's performance is independent of the amount of force being applied and at no time does it lock and become a rigid structural member. Another aspect of snubber design is that slow movements, such as thermal expansion, are not inhibited.

The operation of the snubber is performed by the interaction of telescoping and rotating components. Two non-rotating telescoping tubes connect the pipe or other component to a fixed structure. Inside these tubes is a ball screw and nut which convert the linear telescoping motion to rotation of the ball screw and drum assembly. The drum assembly is coupled to an inertia mass via a capstan spring.

When a dynamic event occurs in excess of 0.02g the ball screw and drum begin to accelerate the inertia mass. The difference in relative angular acceleration causes a clutch spring that is attached to the inertia mass to contact the capstan spring. This causes the capstan spring to tighten around a mandrel which is part of one of the structural tubes. This tightening induces a rotational restraining force to be applied to the ball screw which in turn restricts the linear motion of the telescoping tubes.

CORRECTIVE ACTIONS:

Pacific Scientific has informed PECO that they at one time did apply grease to specific snubber internals in order to reduce break away frictional force. They subsequently discovered that heat, radiation and time will degrade the lubricant which in turn causes an increase in snubber break away and drag force. It is for the above reasons that Pacific Scientific discontinued the use of grease in the capstan spring area after June 1985.

PECO has identified all snubber installations that use size PSA-10 snubbers and will install those snubbers manufactured after June of 1985.

Due to the availability of PSA-10 snubbers during the course of construction for Limerick Unit 2, if it becomes necessary to install snubbers manufactured prior to June 1985, then only those snubbers with acceptable functional test results will be used.

Because the snubber rotating parts are symmetrical and unaffected by the direction of rotation, the above principles of operation apply to the snubber in both tension and compression.

During thermal movement, because the acceleration is much less than the threshold value of 0.02g, the inertia mass moves slowly and does not tighten the capstan spring; therefore, no restraining force is applied by the snubber.

DESCRIPTION OF DEFICIENCY:

During recent Technical Specification surveillance testing of Limerick Unit 1 snubbers approximately 30% of all size PSA-10 snubbers that were tested were found to have acceleration values greater than 0.02g. Testing of all Unit 1 snubbers that required functional examination was performed by Wyle Laboratories personnel using a Wyle Laboratories Model 150 snubber test machine.

All PSA-10 snubbers with test results that exceeded the established acceptance criteria were disassembled, inspected to determine the cause of the exceedance, and rebuilt. For the specific case of high acceleration it was determined that an excessive amount of grease was applied to internal components. The excess grease was removed from the snubber and they were re-assembled and re-tested. With the exception of 5 PSA-10 snubbers, all test results showed a drastic reduction in acceleration values. However, acceleration values for these 5 snubbers could not be reduced to less than 0.02g with degreasing alone and the final solution was to replace the clutch spring and capstan spring on each snubber with newer designed parts from Pacific Scientific. Subsequent testing showed that the replacement parts lowered acceleration values to less than 0.02g.

Because of the identified deficiency encountered during Unit 1 testing, the corrective actions described below have been implemented for Limerick Unit 2.

ANALYSIS OF SAFETY IMPLICATIONS:

High activation acceleration values for PSA-10 snubbers represents a condition that may reduce the availability of safety related systems. High acceleration snubbers can cause failure of sensitive equipment by allowing larger piping/equipment displacements than were originally accepted. These displacements could affect the operability of the sensitive components and possibly render a system inoperable. Since Limerick Unit 2 is under construction the impact of these safety implications is minimal.