

COPY

Kin-Tech Division



September 14, 1983

U.S. Nuclear Regulatory Commission
Office of Inspection & Enforcement
1450 Maria Lane
Suite 210
Walnut Creek, CA 94596

Attention: Mr. Dennis Haist

Gentlemen:

During testing of Pacific Scientific Company's PSA-1 shock arrestors, part number 1801102-05, at Union Electric Calloway Station by Daniel International personnel, 5 of 7 snubbers tested failed. Disassembly by Union Electric personnel revealed one broken capstan spring tang on each of the 5 failed snubbers.

Pacific Scientific Company requested failed springs for independent metallurgical examination. Failed components were returned to Pacific Scientific Company who forwarded broken springs to "Mettek", 1805 E. Carnegie, Santa Ana, CA 92705, (714) 549-1083, for metallurgical and fracture analysis.

One spring exhibiting a visual crack in one tang (removed from snubber S/N 21524) was installed by Pacific Scientific Co. into a snubber and subjected to a full load (1500 lbs.) acceleration test per Acceptance Test Procedure, IT-519. This test was repeated 5 times (10 full load cycles) with no failures. The cracked spring was then subjected to a dynamic load cycling test per DR 1377. This test cycles the snubber at 3 Hertz intervals from 3 to 33 Hertz for 10 seconds at each interval at 100%, 75% and 50% rated loads, a total of 5940 cycles. The cracked spring satisfactorily passed this test.

Further testing was accomplished by Pacific Scientific Company using the production acceptance test machine in an effort to reproduce test results obtained at the Calloway site. Test results were substantively duplicated and indicated that the capstan spring tang had been broken off prior to testing by Daniel International.

Pacific Scientific Co. 100% functionally tests snubbers prior to shipment and review of test results indicates snubbers were satisfactory at time of shipment.

In an effort to determine if spring failure could be generic, Pacific Scientific Co. researched snubber shipments of springs from the identical lot as those that failed. Union Electric Co. personnel effected the return of 11 additional snubbers from

Kansas Gas & Electric Co. Wolf Creek Station. These were returned to Pacific Scientific on Sept. 9, 1983, for testing and evaluation.

Eleven (11) each 1801102-05 PSA-1 shock arrestors returned to Pacific Scientific Co. by Kansas Gas & Electric Co. Wolf Creek Station were visually and functionally tested by Pacific Scientific Co. personnel in the presence of Mr. Dave Walsh, KG&E, and Mr. Kit Kitson who represented Union Electric Co. Pacific Scientific personnel present were Mr. W. S. Wright and P. A. Hadnagy.

All eleven PSA-1 shock arrestors (S/Ns 21511 thru 21521) were disassembled to a level permitting verification that the capstan spring was properly installed and whole. The shock arrestors were reassembled and subjected to a successful acceleration test at full rated load (1500 lbs.) per Pacific Scientific Acceptance Test Procedure, IT-519 (Exhibit I).

Following successful functional test, all eleven shock arrestors were disassembled to facilitate visual and non-destructive examination of the capstan springs:

- S/N 21511 - No apparent visual defects. Magnetic particle non-destructive examination revealed indications in both spring tangs with one tang exhibiting three separate indications. Indications were suspected to be micro cracks.
- S/N 21512 - No apparent visual defects. Magnetic particle examination exhibited an indication of one micro crack on one tang.
- S/N 21513 - No apparent visual defects. No magnetic particle examination indications.
- S/N 21514 - No apparent visual defects. No magnetic particle examination indications.
- S/N 21515 - No apparent visual defects. Both tangs exhibited a magnetic particle micro crack indication.
- S/N 21516 - No apparent visual defects. No magnetic particle examination indications.
- S/N 21517 - No apparent visual defects. No magnetic particle examination indications.
- S/N 21518 - No apparent visual defects. Both tangs exhibited a magnetic particle micro crack indication.
- S/N 21519 - No apparent visual defects. Both tangs exhibited a magnetic particle micro crack indication.

S/N 21520 - No apparent visual defects. One tang exhibited a magnetic particle micro crack indication.

S/N 21521 - No apparent visual defects. One tang exhibited a magnetic particle micro crack indication.

Five (5) capstan springs exhibiting non-destructive magnetic particle examination indications were assembled into a test snubber and subjected to a dynamic load of 1500 lbs. at frequencies of 3 to 33 Hertz intervals for 10 seconds each at 100%, 75% and 50% of rated load.

The springs tested represented the "worst case" as determined by the non-destructive magnetic particle inspection. They were S/Ns 21511, 21515, 21518, 21519 and 21520.

Springs, S/Ns 21515 and 21518, survived the entire test (5940 cycles). Spring, S/N 21511, survived 533 full load cycles before both tangs failed. S/N 21519 survived 1800 full load cycles before one tang failed, and S/N 21520 survived 1850 full load cycles before one tang failed.

The capstan springs are manufactured for Pacific Scientific Co. by John Evans' Sons, Inc., Lansdale, PA. These springs are supplied formed, stress relieved and 100% magnetic particle inspected to Pacific Scientific Co., who then subcontracts the springs for silver plating. Pacific Scientific Co. part numbers for the capstan springs are as follows:

PSA-1 (1801613)

PSA-3 (1801614)

Initial oral report by "Mettek" metallurgist, Mr. Larry McKnight, indicates springs had micro cracks at root of tang radius. Investigation revealed plating salt discoloration and/or presence of silver on fracture face. This indicates springs cracked prior to or during the silver plating process. Metallurgist opinion is that spring vendor's forming process provides the conditions which will allow parts to crack during exposure to silver plating process.

Pacific Scientific is effecting corrective action with J. Evans Co., the nature of which is not yet fully established.

Recommendations

Inspect all PSA-1 and PSA-3 shock arrestors which contain capstan springs manufactured by John Evans Co.

Inspection should include removal of spring to facilitate examination for tang cracks by use of magnetic particle or liquid penetrant non-destructive examination.

Recommendations (Cont'd.)

Urgency of inspection will need to be assessed by individual owners based on snubber system application and analysis of results of tests conducted on failed snubbers and reported herein.

Pacific Scientific is preparing a service bulletin to describe method of spring removal and reinstallation.

Affected Serial Numbers

PSA-1 Pacific Scientific Part No. 1801102-05

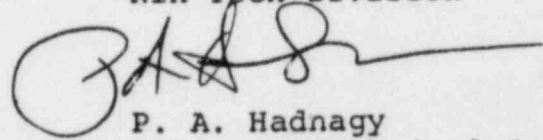
S/Ns 15672 thru 16921, 18211 thru 21160, 21411 thru
22060, 22311 thru 22710

PSA-3 Pacific Scientific Part No. 1801106-05

S/Ns 21311 thru 21610, 24311 thru 25310, 25361 thru
25960, 27194 thru 28543

Very truly yours,

PACIFIC SCIENTIFIC
Kin-Tech Division



P. A. Hadnagy
Director Technical Operations

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