

General Information or Other (PAR)

Event # 45459

Rep Org: ENGINE SYSTEMS, INC	Notification Date / Time: 10/23/2009 16:32 (EDT)
Supplier: ENGINE SYSTEMS, INC	Event Date / Time: 08/24/2009 (EDT)
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Region: 1	Docket #:
City: ROCKY MOUNT	Agreement State: Yes
County:	License #:
State: NC	
NRC Notified by: PAUL STEPANTSCHENK	Notifications: NEIL OKEEFE R4DO
HQ Ops Officer: BILL HUFFMAN	J.THORP (e-mail) NRR
Emergency Class: NON EMERGENCY	O.TABATABAI (e-mail) NRO
10 CFR Section:	
21.21 UNSPECIFIED PARAGRAPH	

INTERIM REPORT ON THERMOSTATIC VALVE FAILURE ON PALO VERDE EDG

"This interim report is being issued because Engine Systems, Inc. (ESI) is not able to complete an evaluation of an identified deviation within the 60 day requirement of 10CFR21.21. The evaluation is expected to be completed no later than November 30, 2009.

"ESI began an evaluation of a thermostatic valve element failure on August 24, 2009. Palo Verde Nuclear Plant notified ESI of the failure as a result of a failure analysis they were performing on a thermostatic valve that had been removed from the lube oil system of their 2A-EDG. The element was in service since April 2008 and Palo Verde verified operation of the element prior to installation.

"The Palo Verde failure analysis determined that one of two elements within the valve was defective. The element failure was attributed to wax leakage past the diaphragm seal on one of two power pills within the element. Evidence of mechanical binding of the piston is believed to have caused the wax leakage. If the piston was jammed, the expanding wax could have over-pressurized the diaphragm seal leading to wax leakage. The failure analysis noted the following to support piston binding:

- The piston was initially difficult to remove from its guide tube.
- A gouge was observed on the piston surface.
- The rubber plug within the power pill exhibited brass machining chip debris.

"ESI has been coordinating with Palo Verde and the manufacturer (AMOT) to complete our evaluation and to determine if this is a generic issue or if it is an isolated incident.

"To date, no other similar failures with AMOT thermostatic valves have been reported to ESI."

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General Information or Other (PAR)

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Palo Verde has Cooper Bessemer KSV-20T diesel engines that use one 6" thermostatic valve in the engine jacket water system and one in the engine lube oil system to regulate system temperatures during engine operation. The thermostatic valve is an AMOT model 6HAS. The AMOT thermostatic valve element (P/N 9760X) is the defective part. ESI did not provide any information on other nuclear power plants that have EDGs that utilize this model thermostatic valve.

ED 4 45459



ENGINE SYSTEMS, INC.

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TELEFAX

Date: October 23, 2009
Company: NRC Operations Center
Fax Number: 301/816-5151
Verification No.: 301/816-5100
Reference: Report No. 10CFR21-0098-INT, Rev. 0
From: Paul Stepantschenko
Page: 1 of 7

Dear Sir:

Following this cover is a copy of our Interim Report 10CFR21-0098-INT, Rev.0, for a 10CFR21 deviation evaluation about an Amot thermostatic valve element, P/N 9760X.

A copy of the report will be mailed to the NRC Document Control Desk.

Should you have questions, please let us know.

Sincerely,

ENGINE SYSTEMS, INC.

Paul Stepantschenko
Quality Assurance Manager



ENGINE SYSTEMS, INC.

175 Freight Road, Rocky Mount, NC 27804

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Fax: 252/446-1134

Report No. 10CFR21-0098-INT
Rev. 0: 10/23/09

**INTERIM REPORT
10CFR21 REPORTING OF DEFECTS
AND NON-COMPLIANCE**

COMPONENT: Amot thermostatic valve element
P/N: 9760X

SYSTEM: Emergency Diesel Generator – lube oil & jacket water system

CONCLUSION: Not yet completed

Prepared By: *[Signature]*
Engineering Manager

Date: 10/23/09

Reviewed By: *[Signature]*
Quality Assurance Manager

Date: 10/23/09

Report No. 10CFR21-0098-INT

Record of Revisions
Page: 1 of 1

REV	DATE	PAGE	DESCRIPTION
0	10/23/09		Initial issue.

Report No. 10CFR21-0098-INT
Revision: 0
Date: 10/23/09
Page: 1 of 4

COMPONENT:

Amot thermostatic valve element
P/N: 9760X

PURPOSE:

This interim report is being issued because Engine Systems, Inc. (ESI) is not able to complete an evaluation of an identified deviation within the 60 day requirement of 10CFR21.21. The evaluation is expected to be completed no later than November 30, 2009.

SUMMARY:

ESI began an evaluation of a thermostatic valve element failure on August 24, 2009. Palo Verde Nuclear Plant notified ESI of the failure as a result of a failure analysis they were performing on a thermostatic valve that had been removed from the lube oil system of their 2A-EDG. The element was in service since April 2008 and Palo Verde verified operation of the element prior to installation.

The Palo Verde failure analysis determined that one of two elements within the valve was defective. The element failure was attributed to wax leakage past the diaphragm seal on one of two power pills within the element. Evidence of mechanical binding of the piston is believed to have caused the wax leakage. If the piston was jammed, the expanding wax could have over-pressurized the diaphragm seal leading to wax leakage. The failure analysis noted the following to support piston binding:

- The piston was initially difficult to remove from its guide tube.
- A gouge was observed on the piston surface.
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ESI has been coordinating with Palo Verde and the manufacturer (AMOT) to complete our evaluation and to determine if this is a generic issue or if it is an isolated incident.

To date, no other similar failures with Amot thermostatic valves have been reported to ESI.

Report No. 10CFR21-0098-INT
Revision: 0
Date: 10/23/09
Page: 2 of 4

Discussion:

The Cooper Bessemer KSV-20T diesel engine uses one 6" thermostatic valve in the engine jacket water system and one in the engine lube oil system to regulate system temperatures during engine operation. The thermostatic valve is an Amot model 6HAS. Each valve uses 2 thermostatic elements, Amot type 9760X (Figure 1). The element being investigated for the Palo Verde application have a nominal temperature setting of 170°F and therefore the element part number is 9760X-170.

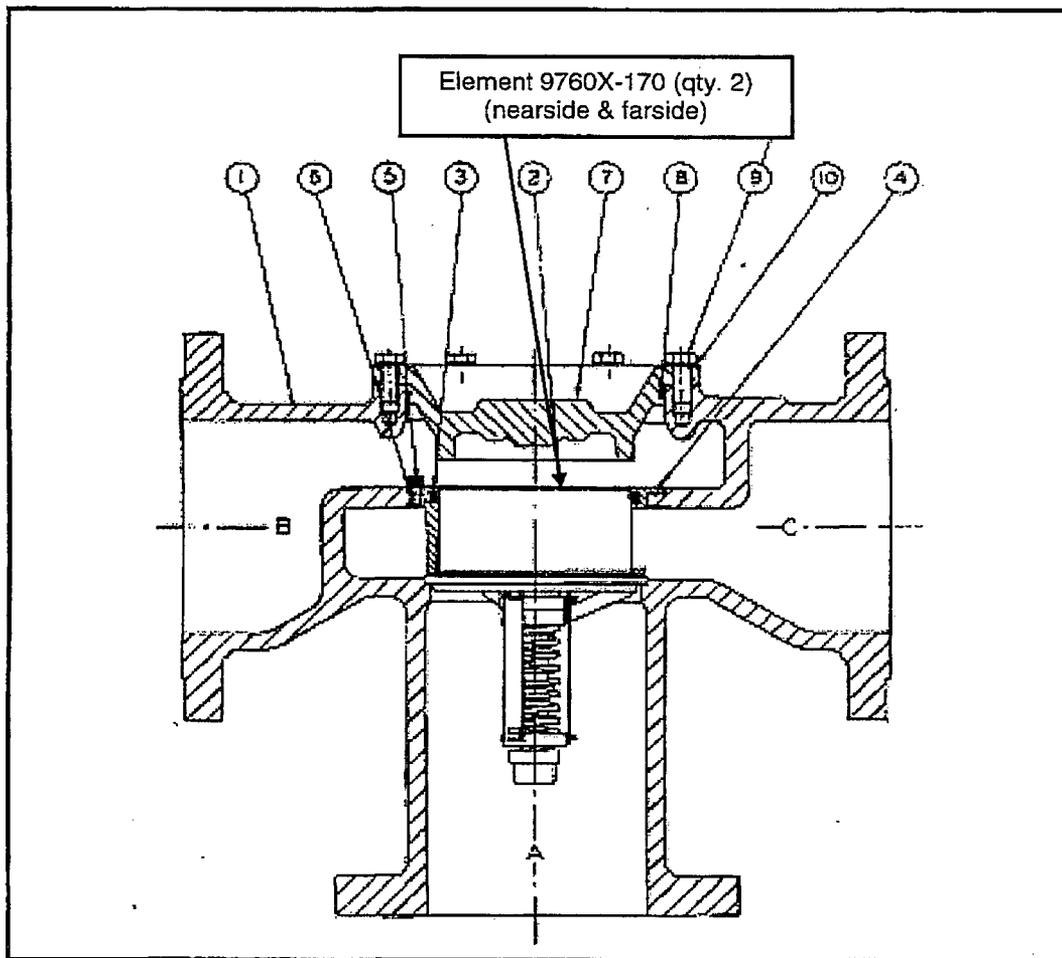


FIGURE 1: AMOT THERMOSTATIC VALVE

Report No. 10CFR21-0098-INT
Revision: 0
Date: 10/23/09
Page: 3 of 4

Each 9760X valve element contains two power pills (Figure 2). The power pills contain a temperature sensitive wax that expands with increasing temperature and provides the motive force to lift the element off of its seat.

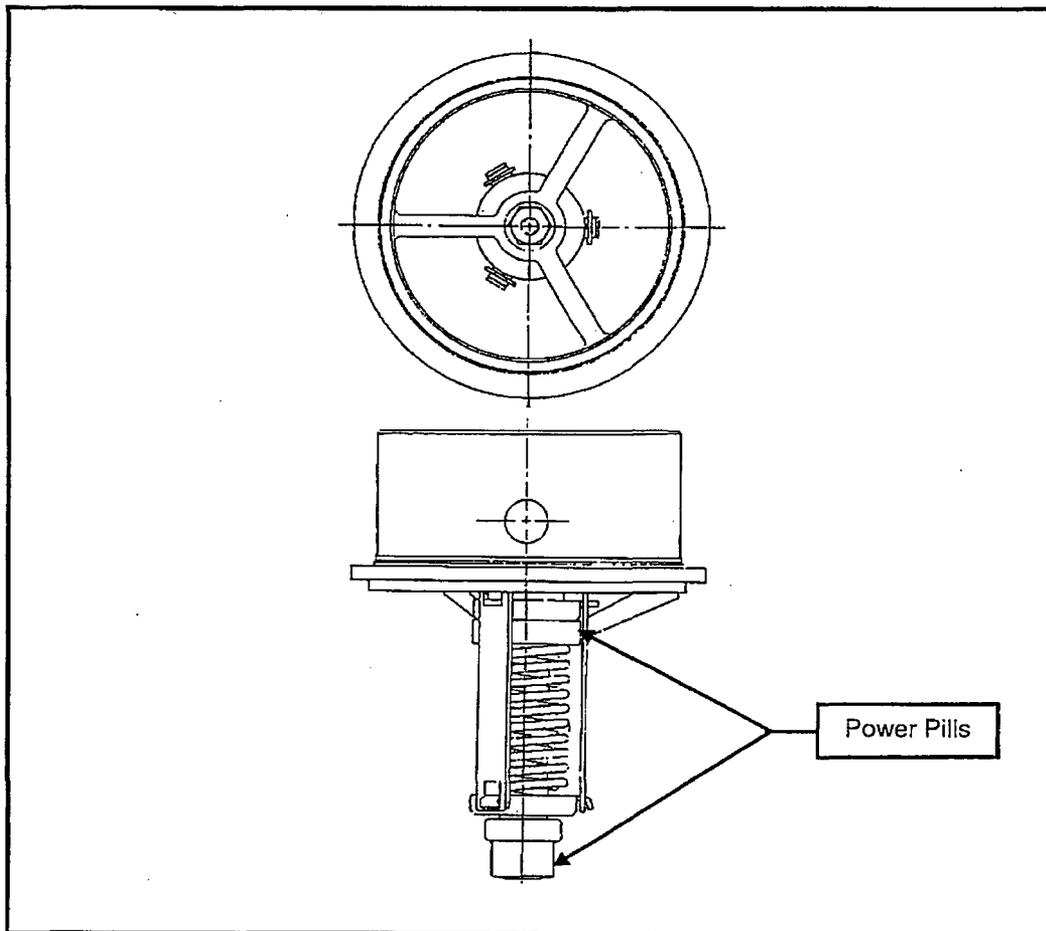


FIGURE 2 – VALVE ELEMENT 9760X

Fig. 3 "A" shows an element assembly with the sliding valve in the cold position (the element shown only has one power pill, but the operating principal is the same as the two pill element). The fluid travels out the by-pass (Port B on the valve) as shown by the arrow.

Fig. 3 "B" shows the sliding valve moved up to the extended or warm position. The by-pass closes off as the sliding valve seats and the fluid is diverted to the outlet (Port C on the valve) as shown by the arrow. In actual operation, the sliding valve is normally in about the mid-position. When the wax material expands with rising temperature, the rubber plug is forced into a reduced diameter in the piston guide, which multiplies the movement of the piston by an extruding action.

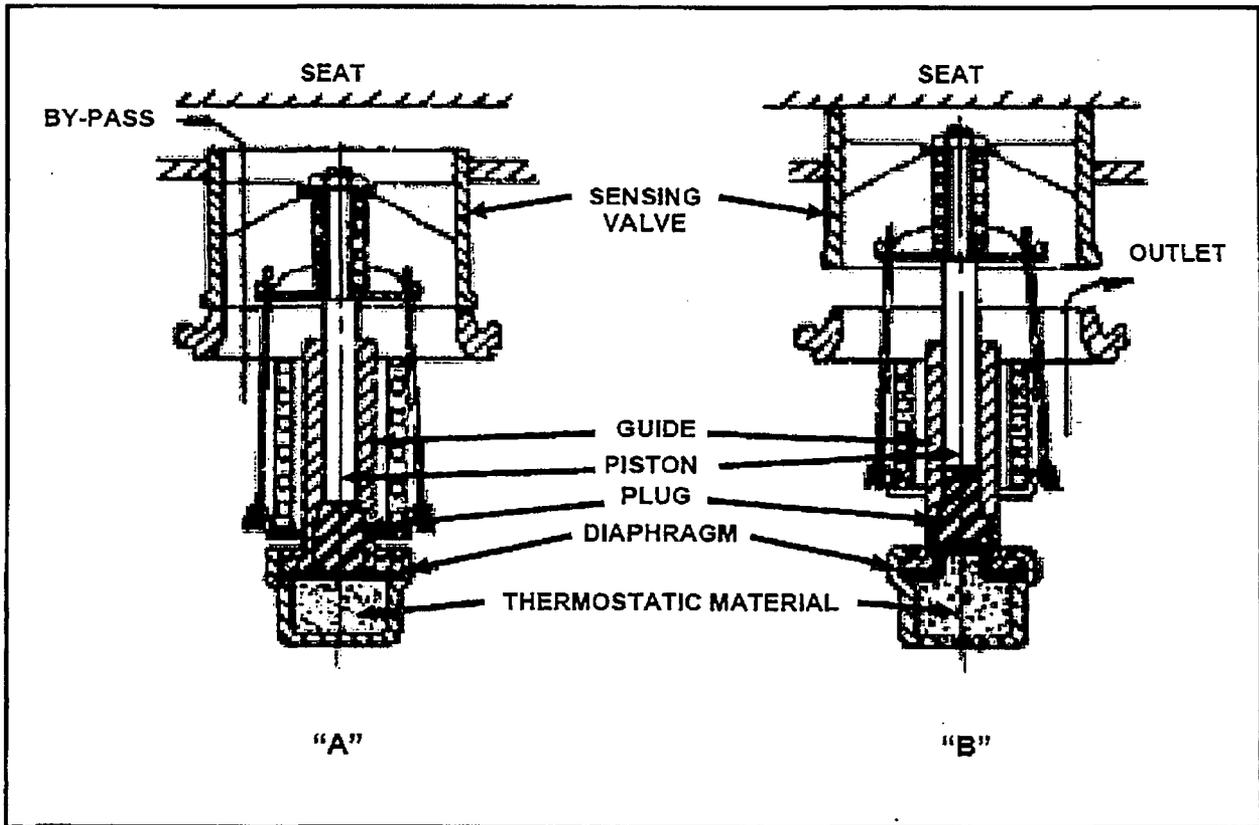


FIGURE 3 – ELEMENT OPERATION