

General Information or Other (PAR)

Event # 40783

Rep Org: ROTORK CONTROLS INC	Notification Date / Time: 05/28/2004 15:51 (EDT)
Supplier: ROTORK CONTROLS INC	Event Date / Time: 05/28/2004 (EDT)
	Last Modification: 06/03/2004
Region: 1	Docket #:
City: ROCHESTER	Agreement State: Yes
County:	License #:
State: NY	
NRC Notified by: KAREN BLACK	Notifications: RICHARD CONTE R1
HQ Ops Officer: MIKE RIPLEY	DAVID AYRES R2
Emergency Class: NON EMERGENCY	SONIA BURGESS R3
10 CFR Section:	MIKE RUNYAN R4
21.21 UNSPECIFIED PARAGRAPH	NRR PART 21 CONTACTS NRR
	NMSS PART 21 CONTACT NMSS

## PART 21 NOTIFICATION - VALVE ACTUATOR SWITCH MECHANISMS

**"Basic Component Affected**

Rotork NA1 switch mechanism assemblies manufactured between 1978 (post 78 build) and November 2001 supplied either as a spares item or fitted in an NA1 type Electric Valve Actuator. Customers supplied with potentially affected actuators manufactured between January 1998 and November 2001, were previously notified individually of this condition and may have completed the risk assessment and corrective action detailed below. This report extends the affected time frame, potentially affecting actuators not identified on the original notifications.

"Rotork NA4, NA5, NA1E and NAE5 type Electric Valve Actuators are not affected.

**"Nature of the Defect and Associated Safety Hazard**

It has recently been identified that the molded (PPS) components within the switch mechanism assembly have a low level of crystallinity and it cannot be confirmed that they are to the same specification as those originally tested and qualified at Wyle in 1978 (refer test report 43979-1 Rev A).

**Effect on Functionality**

The report provides a detailed explanation of the effect on function depending on the valve position and open/close action.

"NA4 and NAS type Electric Valve Actuators have a maximum ambient temperature rating of 70 deg C (160 deg F) and are not affected. NA1 type Electric Valve Actuators have the same ambient temperature rating but can be subject to a loss of coolant accident (LOCA). The condition reported will only affect Valve Actuators in plant locations where: 1) the LOCA and Operational temperature specifications, as defined in the Design Basis Document for each facility and location, could result in the switch mechanism components exceeding 80 deg C (176 deg F) and 2) The switch mechanism fitted was manufactured between 1978 and November 2001 and 3) The actuator is exposed to the two conditions outlined in section 2.0 of the report."

IE19

General Information or Other (PAR)

Event # 40783

\*\*\* UPDATE AT 1200 EDT ON 6/03/04 TO S. SANDIN VIA FAX \*\*\*

A revision to this report changes the Rotork model number from NAE5 to NA5E.

Notified R1DO (Jenison), R2DO (Fredrickson), R3DO (Lanksbury), R4DO (Sanborn), NMSS Part 21 Coordinator (Torres) and NRR Part 21 Coordinator (Hodge) via fax.

\*\*\*\*\*

ROTORK CONTROLS, INC.  
675 Mile Crossing Blvd.  
Rochester, New York 14624

Phone: 585-328-1550  
Fax: 585-328-3848

facsimile transmittal

To: NRC Operations Centre Fax: 301 816 5151

---

Attn: Allan Barker Date: June 3, 2004

---

From: Karen Black Pages: 1 of 6

---

Re: Revised part 21 report

---

Urgent     For Review     Please Comment     Please Reply     Please Recycle

---

10CFR21 REPORT

Report To: NRC Operations Centre

By Mail: NRC Document Control Desk  
US Nuclear Regulatory Commission  
Washington DC 20555

By Fax: 301 816 5151

Report Filed By: Rotork Controls Inc.  
675 Mile Crossing Blvd  
Rochester NY 14624

Original Report Date: May 28, 2004

Revision Date: June 3, 2004

Revision Detail: Changed model number in section 1.0 from NAE5 to NA5E

Originated By: Karen Black  
Quality Manager

Approved By: Bob Arnold  
President

Signed *K.C. Black*.....

*Bob Arnold*  
.....  
*June 3 2004*

Date *June 3, 04*.....

1.0 Basic Component Affected

Rotork NA1 switchmechanism assemblies manufactured between 1978 (post 78 build) and November 2001 supplied either as a spares item or fitted in an NA1 type Electric Valve Actuator.

*Customers supplied with potentially affected actuators manufactured between January 1998 and November 2001, were previously notified individually of this condition and may have completed the risk assessment and corrective action detailed below. This report extends the affected time frame, potentially affecting actuators not identified on the original notifications.*

Rotork NA4, NA5, NA1E and NA5E type Electric Valve Actuators are not affected.

2.0 Nature of the Defect and Associated Safety Hazard

It has recently been identified that the molded (PPS) components within the switchmechanism assembly have a low level of crystallinity and it cannot be confirmed that they are to the same specification as those originally tested and qualified at Wyle in 1978 (refer test report 43979-1 Rev A).

The results of testing conducted in the first quarter of 2002 indicated that the deficiency was limited to product manufactured between January 1998 and November 2001. All affected product was identified through manufacturing records, customers and end users traced and notified in writing. Recent tests have however shown that there is variation in the crystallinity of components manufactured before January 1998. The process was not adequately controlled to ensure consistency of the crystallinity index above 15% and the components supplied may have a low level of crystallinity, which is insufficient for high temperature applications.

The Wyle test monitored the trip point of the switchmechanism switches throughout the qualification program and was reported to be acceptable. This would imply that either that the PPS components in the switchmechanism tested were annealed or that the thermal aging process during the test program annealed the components.

A controlled and documented annealing process was added for all PPS components in November 2001.

Molded PPS switchmechanism components with a low level of crystallinity could distort in extreme circumstances, inhibiting correct operation of the mechanism. For the distortion to occur, the following conditions must exist simultaneously:

1. The actuator is held in the fully open or fully closed position.
2. The temperature of the *switchmechanism components* is above 80°C (176°F).

### 3.0 Effect on Functionality

- Testing has confirmed the switchmechanism is unaffected at or below 80°C (176°F) and prior to the *switchmechanism components* exceeding 80°C (176°F) the switchmechanism will function correctly.
- If the valve is in mid travel and the *switchmechanism components* are exposed to 110°C (230°F) for 2 hours or more the PPS components will anneal, there will be no distortion and the switchmechanism and the actuator will function correctly thereafter.
- An affected actuator will respond correctly to command signals to alter state until the *switchmechanism components* exceed 80°C (176°F).

Attachment A provides a detailed explanation of the effect on function depending on the valve position and open/close action.

*Attachment B provides a chart showing the approximate time delay from when the actuator is exposed to different ambient temperatures and the switchmechanism components exceeding 80°C (176°F). This should enable assessment of the temperature-time limits for individual site conditions.*

### 4.0 Date of Discovery

March 31, 2004

### 5.0 Number and Location of Components (Valve Actuators) Affected

NA4 and NA5 type Electric Valve Actuators have a maximum ambient temperature rating of 70C (160F) and are not affected.

NA1 type Electric Valve Actuators have the same ambient temperature rating but can be subject to a loss of coolant accident (LOCA). The condition reported will only affect Valve Actuators in plant locations where

- The LOCA and Operational temperature specifications, as defined in the Design Basis Document for each facility and location, could result in the *switchmechanism components* exceeding 80°C (176°F) (Refer to the time delay chart in Attachment B) and
- The switchmechanism fitted was manufactured between 1978 and November 2001 and
- The actuator is exposed to the two conditions outlined in section 2.0.

### 6.0 Corrective Action

This condition can be corrected without removing the actuator from service, or the switchmechanism from the actuator, by annealing "in situ" as documented in Rotork procedure NEP01. Alternatively the switchmechanism can be removed from the actuator and annealed as a separate assembly as documented

in Rotork Procedure NEP02. The effect on Qualified Life of the annealing process is documented in Rotork report ER244.

The final option is to replace the switchmechanism with one manufactured after November 2001.  
Note: If the switchmechanism is replaced the actuator must be recalibrated.

**7.0 Recommended Actions**

Each utility must assess whether there are any NAJ actuators installed, fitted with a switchmechanism manufactured between 1978 and November 2001, that could be exposed to the two conditions described in section 2.

The results should be reported to Karen Black, Quality Manager Rotork Inc. to arrange the rework schedule.

e-mail: [karen.black@rotork.com](mailto:karen.black@rotork.com)  
telephone: 585 328 1550 x242  
fax: 585 328 5848

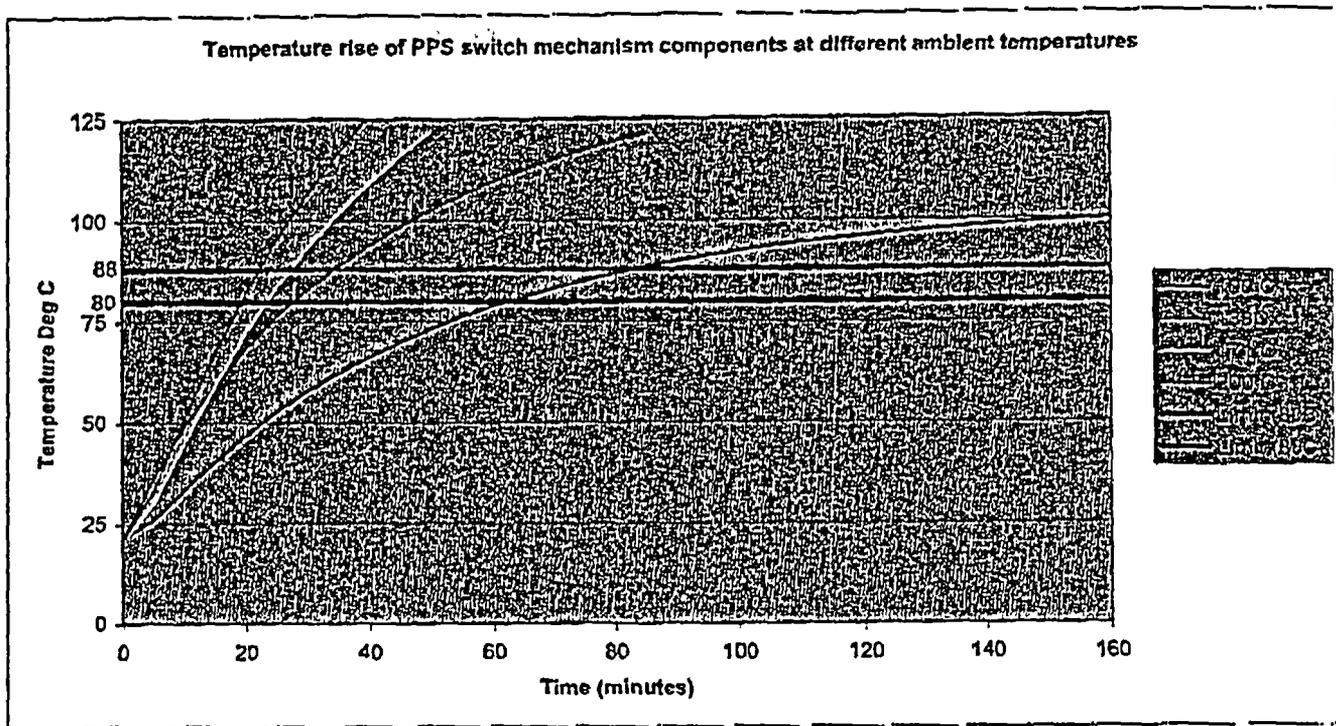
**ATTACHMENT A  
POSSIBLE EFFECT ON FUNCTIONALITY**

Status of Valve Prior to the <i>switchmechanism</i> components exceeding 80°C (176°F)		Effect on Function After the <i>switchmechanism</i> components have exceeded 80°C (176°F)	
Valve Position	Open/Close Status	Open/Close Command	Effect on Function
CLOSE	CLOSED ON TORQUE	NONE	None.
CLOSE	CLOSED ON TORQUE	CLOSE	None.
CLOSE	CLOSED ON LIMIT	CLOSE	Limit switch may reset and actuator may restart and apply higher torque or stall torque to the closed seat.
CLOSE	CLOSED ON TORQUE	OPEN ON LIMIT	The actuator could stall when running in the open direction and may show incorrect indication.
CLOSE	CLOSED ON LIMIT	OPEN ON LIMIT	The actuator could stall when running in the open direction and may show incorrect indication.
OPEN	OPENED ON LIMIT	CLOSE ON TORQUE	The actuator will run in the close direction but may stall in the fully closed position and may show incorrect indication.
OPEN	OPENED ON LIMIT	CLOSE ON LIMIT	The actuator will run in the close direction but may stall in the fully closed position and may show incorrect indication.
OPEN	OPENED ON LIMIT	NONE	None.
OPEN	OPENED ON LIMIT	OPEN	Limit switch may reset and actuator may restart and apply higher torque or stall torque to the open seat.
MID TRAVEL	N/A	OPEN ON LIMIT or CLOSE ON TORQUE or CLOSE ON LIMIT	The actuator will run in the direction of the command and will stop at the end of travel on limit or torque depending on the setting. Further commands to operate the actuator will be affected as detailed above.

**Note:**

1. Testing has confirmed the function of the *switchmechanism* is unaffected at or below 80°C (176°F)
2. If the valve is in mid travel and the *switchmechanism* is exposed to 110°C (230°F) for 2 hours or more the PPS components will anneal, there will be no distortion and the *switchmechanism* and the actuator will function correctly thereafter.
3. Attachment B provides a chart showing the approximate time delay from when the actuator is exposed to different ambient temperatures and the *switchmechanism* components exceeding 80°C (176°F). This should enable assessment of the temperature-time limits for individual site conditions.

## ATTACHMENT B



The manufacturer's datasheet states that the critical temperature for PPS is *about* 88°C (190°F). This temperature is shown on the chart and in the table below for reference purposes.

As a result of extensive testing, Rotork can guarantee functionality providing the *switchmechanism components* do not exceed 80°C (176°F).

Ambient Temperature	Time to reach 80°C (176°F) in minutes	Time to reach 88°C (190°F) in minutes
100°C (212°F)	60	80
138°C (280°F)	23	30
171°C (340°F)	19	23
200°C (392°F)	14	17

Power Reactor

Event # 40788

Site: LIMERICK		Notification Date / Time: 06/03/2004 12:47 (EDT)				
Unit: 1 2	Region: 1	Event Date / Time: 06/03/2004 12:45 (EDT)				
Reactor Type: [1] GE-4,[2] GE-4		Last Modification: 06/03/2004				
Containment Type: MARK II MARK II						
NRC Notified by: STAN GAMBLE		Notifications: KENNETH JENISON R1				
HQ Ops Officer: ARLON COSTA		TERRY REIS NRR				
Emergency Class: NON EMERGENCY		PAUL FREDRICKSON R2				
10 CFR Section:		ROGER LANKSBURY R3				
21.21	UNSPECIFIED PARAGRAPH	GARY SANBORN R4				
Unit	Scram Code	RX Crit	Init Power	Initial RX Mode	Curr Power	Current RX Mode
1	N	Yes	100	Power Operation	100	Power Operation
2	N	Yes	100	Power Operation	100	Power Operation

**PART 21 NOTIFICATION OF FAILURE OF SPRING CHARGING FUNCTION IN CIRCUIT BREAKER**

"Limerick has completed the 10CFR Part 21 evaluation of the failure of the spring charging function on an Asea Brown Boveri (ABB) Model HK circuit breaker. The investigation determined that the primary contributor to the failure was the replacement of ABB latch reset torsion spring number 195205A00 with a weaker spring that was supplied with the breaker overhaul kit number 716656T104. Secondary contributors to the failure were normal wear on additional parts in the operating mechanism.

"ABB supplied a six-turn latch reset torsion spring and a five-turn latch reset torsion spring under spring part number 195205A00 and overhaul kit number 716656T104. The spring of concern is a six-turn spring that does not provide as much force as the original six-turn or five-turn spring. When informally tested during the investigation the six-turn spring provided approximately 66 ounces of force and the five-turn spring provided approximately 102 ounces of force. The original six-turn spring provided a force of 88 ounces.

"Limerick's evaluation concluded that installation of the replacement six-turn latch reset torsion spring could create a substantial safety hazard depending on the breaker's application. Therefore, this notification is being submitted pursuant to the requirements of 10CFR21.21(d)(3)(i). The required 10CFR21.21(d)(3)(ii) 30-day written notification will provide more detail when submitted. ABB evaluation of this issue is still in progress."

The licensee notified the NRC Resident Inspector.

\*\*\*\*\*

NRC FORM 361 (12-2000)	<b>REACTOR PLANT EVENT NOTIFICATION WORKSHEET</b>	U.S. NUCLEAR REGULATORY COMMISSION OPERATIONS CENTER EN# <b>40788</b>
---------------------------	---	---

NRC OPERATION TELEPHONE NUMBER: PRIMARY -- 301-816-5100 or 800-532-3469\*, BACKUPS -- [1st] 301-951-0550 or 800-449-3694\*, [2nd] 301-415-0550 and [3rd] 301-415-0553  
\*Licensees who maintain their own ETS are provided these telephone numbers.

NOTIFICATION TIME <b>12:47</b>	FACILITY OR ORGANIZATION <b>Limerick</b>	UNIT <b>1&amp;2</b>	NAME OF CALLER <b>Stan Gamble</b>	CALL BACK # <b>610-718-3404</b>
-----------------------------------	---	------------------------	--------------------------------------	------------------------------------

EVENT TIME & ZONE <b>1245 EDT</b>	EVENT DATE <b>6-3-04</b>	POWERMODE BEFORE <b>100% / 1</b>	POWERMODE AFTER <b>100% / 1</b>
--------------------------------------	-----------------------------	-------------------------------------	------------------------------------

EVENT CLASSIFICATIONS		1-Hr. Non-Emergency 10 CFR 50.72(b)(1)	(v)(A) Safe S/D Capability	ANA
GENERAL EMERGENCY	GEN/AEC	TS Deviation	(v)(B) RHR Capability	ANE
SITE AREA EMERGENCY	SIT/AEC	4-Hr. Non-Emergency 10 CFR 50.72(b)(2)	(v)(C) Control of Rad Release	ANC
ALERT	AL/AEC	(i) TS Required S/D	(v)(D) Accident Mitigation	AND
UNUSUAL EVENT	UN/AEC	(iv)(A) ECCS Discharge to RCS	(d) Offsite Medical	AMED
50.72 NON-EMERGENCY	(see next column)	(iv)(B) RPS Actuation (scream)	(vii) Loss Conn/Asmt/Resp	ACOM
PHYSICAL SECURITY (73.71)	DDDD	(d) Offsite Notification	60-Day Optional 10 CFR 50.73(a)(1)	
MATERIAL EXPOSURE	B777	8-Hr. Non-Emergency 10 CFR 50.72(b)(3)	Invalid Specified System Actuation	ANV
FITNESS FOR DUTY	HFT	(ix)(A) Degraded Condition	Other Unspecified Requirement (Identify)	
✓ OTHER UNSPECIFIED REQMT.	(see last column)	(ix)(B) Unanalyzed Condition	✓ Part 21	NONR
INFORMATION ONLY	NNF	(iv)(A) Specified System Actuation	AESF	NONR

**DESCRIPTION**

Include: Systems affected, actuations and their initiating signals, causes, effect of event on plant, actions taken or planned, etc. (Continue on back)

Limerick has completed the 10CFR Part 21 evaluation of the failure of the spring charging function on an Asea Brown Boveri (ABB) Model HK circuit breaker. The investigation determined that the primary contributor to the failure was the replacement of ABB latch reset torsion spring number 195205A00 with a weaker spring that was supplied with the breaker overhaul kit number 716656T104. Secondary contributors to the failure were normal wear on additional parts in the operating mechanism.

ABB supplied a six-turn latch reset torsion spring and a five-turn latch reset torsion spring under spring part number 195205A00 and overhaul kit number 716656T104. The spring of concern is a six-turn spring that does not provide as much force as the original six-turn or five-turn spring. When informally tested during the investigation the six-turn spring provided approximately 66 ounces of force and the five-turn spring provided approximately 102 ounces of force. The original six-turn spring provided a force of 88 ounces.

Limerick's evaluation concluded that installation of the replacement six-turn latch reset torsion spring could create a substantial safety hazard depending on the breaker's application. Therefore, this notification is being submitted pursuant to the requirements of 10CFR21.21(d)(3)(i). The required 10CFR21.21(d)(3)(ii) 30-day written notification will provide more detail when submitted. ABB evaluation of this issue is still in progress.

NOTIFICATIONS	YES	NO	WILL BE	ANYTHING UNUSUAL OR NOT UNDERSTOOD?	<input type="checkbox"/> YES (Explain above)	<input checked="" type="checkbox"/> NO
NRC RESIDENT	✓			DID ALL SYSTEMS FUNCTION AS REQUIRED?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO (Explain above)
STATE(s)		✓		MODE OF OPERATION UNTIL CORRECTED:	<b>1</b>	ESTIMATED RESTART DATE:
LOCAL		✓				<b>NA</b>
OTHER GOV AGENCIES		✓		ADDITIONAL INFO ON BACK		
MEDIA/PRESS RELEASE		✓		<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		