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US Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

Perry Nuclear Power Plant (PNPP)  
Docket No. 50-440  
Update on Potential Loss of Fill-Oil  
in Rosemount Transmitters  
(Bulletin 90-01)

Gentlemen:

The subject Bulletin requested that PNPP (1) identify the installation of designated models of Rosemount transmitters in safety-related systems, and (2) take appropriate corrective actions for transmitters that may leak fill-oil. \* Primarily due to a vendor update to the original Rosemount 10 CFR 21 notification we are updating our original response to the Bulletin which was provided in PY-CEI/NRR-1199L, dated 7/17/90. The Bulletin outlined specific reporting requirements which are updated as follows:

1. This letter confirms that:

- (a) Items 1, 2, 3, 4 and 5 of the Bulletin Requested Actions are completed.
- (b) Designated transmitters that have exhibited loss of fill-oil are identified and their disposition is discussed in Attachment 1.
- (c) "Suspect lot" transmitters are listed by application and scheduled for replacement as indicated in Attachment 1.

Two transmitters originally planned for third cycle service are being replaced this outage due to oil loss indication. We consider this to be further evidence that calibration trend evaluation is an effective way to detect oil loss, and that it provides assurance that the transmitters remaining in service are sound and reliable.

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\* Rosemount May 10, 1989 10CFR21 Notification, Rosemount Technical Bulletin #4 Master Suspect List

Operating Units  
Cleveland Electric Illuminating  
Toledo Edison

9012270278 901221  
PDR AIDOCK 05000440  
Q PDR

880831

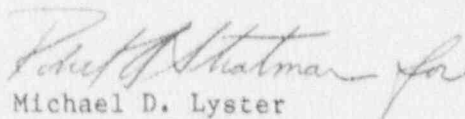
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2. Designated transmitters that exhibit loss of fill oil symptoms, or that lose fill oil, will continue to be reviewed for reportability under established procedures and applicable regulations. If not reportable, information consistent with that found in the Attachments will be maintained for each transmitter so identified.

We also maintain that selective replacement of "suspect" transmitters during our second refueling outage, and replacement of the remaining such transmitters either during third cycle operation or our third refueling outage, will maintain margins of safety consistent with the original operating license. Attachment 2 provides the basis for continued operation with supporting justification.

Please feel free to call if you have additional questions.

Sincerely,

  
Michael D. Lyster

MDL:WJE:njc

Attachments

cc: NRC Region III  
NRC Resident Inspector Office  
NRR Project Manager  
NUMARC - Alex Marion

History of Rosemount (and "Suspect Lot")  
Transmitter Performance at PNPP

In accordance with Bulletin 90-01 Requested Actions #1 and #2, "suspect lot" Rosemount transmitters identified by Rosemount in the 5/10/89 10CFR21 Notification and later Addenda, and installed in PNPP "safety-related systems or systems installed in accordance with 10CFR50.62 (the ATWS rule)" are identified in the following table. The previous calibration data for the 35 transmitters listed below has been compiled and analyzed for cumulative zero shift (the reactor head spray flow indication transmitter is for indication only; a review of calibration data on its instrument loop revealed no adjustments required to the transmitter during any of the loop calibrations). The trend data on transmitters remaining in service show no distinguishable zero shift trend with at least 4 calibration points per instrument by the end of the current outage, with the exception of E12N026B further discussed below.

The following table identifies the replacement schedule for each transmitter. Revision bars in the left margin identify additions or changes to the table. Two columns were added to the table for all identified transmitters; one column identifies serial numbers, the second column identifies transmitters that are contained in ESF actuation systems.

RHR SUSPECT-LOT TRANSMITTERS

Note	Part No.	Serial No.	ESF Actuation	System	Function
(1)	*B21N044C#	408752		NSSS	} RPV water level indication (Fuel Zone)
(1)	B21N044D#	408753		NSSS	
(1)	*B21N490#	408750		NSSS	
(1)	B21N073C#	408756	+	NSSS	} RPV water level 2/WPCS initiation, level 3/WPCS isolation
(1)	**B21N073G	408757	+	NSSS	
(1)	*B21N073L	408758	+	NSSS	
(1)	**B21N073R	408759	+	NSSS	
(1)	*B21N081B	407998	+	NSSS	} RPV water level 1/MSIV isolation, level 2/BOP isolation
(1)	B21N081C	407999	+	NSSS	
(1)	B21N081D	407994	+	NSSS	
(1)	*B21N091A#	408001	+	NSSS	RPV water level 1 LPCS + LPCI "A" + RCIC initiation
(1)	**B21N091B#	408002	+	NSSS	RPV water level 1 LPCI "B" & "C" + RCIC initiation
(1)	**B21N091E	408003	+	NSSS	RPV water level 1 LPCS + LPCI "A" + RCIC initiation
(2)	C61N001	407993		Remote Shutdown	RHR A system flow indication
(2)	C61N010	407995		-	RPV water level indication
(2)	P45N071A	406218		ESW	Diesel ESW flow indication
(2)	P45N071B	406219		ESW	Diesel ESW flow indication
(3)	G43N090B#	406167		Suppression Pool Makeup	Suppression pool water level indication
(5)	G43N020B	262226		-	Separator storage well level indication
(4)	*B21N075A	406658	+	NSSS	} Low condenser vacuum/isolation
(4)	B21N075C	406660	+	NSSS	
(4)	B21N075D	406661	+	NSSS	
(1)	E31N084B	408761	+	Leak Detection	RHR/RCIC steam flow high/isolation
(7)	*E31N083B	407996	+	-	RCIC steam pressure/isolation
(6)	E31N075B	408751	+	-	RWCU differential flow/isolation
(9)	E31N092	408009		-	Reactor head flange leak indication & alarm
(6)	E31N080A	414382		-	RHR/LPCS & LPCI "A" in-vessel leak indication & alarm
(6)	E31N080B	414375		-	RHR LPCI "B" & "C" in-vessel leak indication & alarm
(4)	E12N062B	412938	+	RHR	Containment pressure/spray initiation
(4)	E12N062C	412939	+	RHR	Containment pressure/spray initiation

PNRP SUSPECT-LOT TRANSMITTERS

<u>Note</u>	<u>Part No.</u>	<u>Serial No.</u>	<u>ESF</u> <u>Actuation</u>	<u>System</u>	<u>Function</u>
(2)	E12N013	408157		RHR	Reactor head spray flow indication
(2)	E22N005	408159		HPCS	HPCS flow indication
(6)	B21N095B	408550	+	NSSS	RPV level 3/ADS "B" initiation, level 2/RCIC isolation
(8)	E12N026F	408006		RHR	Steam pressure control in RHR steam condensing mode
(6)	B21N402F	415938	+	NSSS	RPV water level 2/recirc pump trip

Notes:

- \* Replaced during second refueling outage, others (without \*) will be replaced either during third cycle operation or third refueling outage.
- \*\* Replaced during second outage due to potential oil loss.
- # Regulatory Guide 1.97 Category 1, used in emergency procedures.
- + Located in an ESF Actuation System.

- (1) Operated 28 months at reactor pressure ~29,000 psi-mo
- (2) 28 months at 50 psi ~ 1400 psi-mo
- (3) 28 months at 22 psi ~ 600 psi-mo
- (4) 68 months at 14.7 psi ~1000 psi-mo
- (5) 30 months at 5 psi ~150 psi-mo
- (6) 30 months at reactor pressure ~30,750 psi-mo
- (7) 15 months at reactor pressure ~15,400 psi-mo
- (8) 30 months at 50 psi ~1500 psi-mo
- (9) Does not operate under pressure

Acronyms

RPV = reactor pressure vessel      MSIV = main steam isolation valve  
LPCS = low pressure core spray      BCP = balance of plant  
LPCI = low pressure coolant injection      RHR = residual heat removal  
RCIC = reactor core isolation cooling      ESW = emergency service water  
HPCS = high pressure core spray



E12N026B is showing potential oil loss, but at such a low rate that replacement prior to restart from the third outage is justified. Transmitter E12N026B is installed in a valve control circuit to maintain steam pressure while operating in the RHR steam condensing mode. Another RHR loop is capable of independently operating in this same non-ESF mode.

Bulletin 90-01 also requested information on any Rosemount Model 1153 Series B, 1153 Series D, and 1154 transmitters that have exhibited loss of fill-oil symptoms. There have been eleven such occurrences at PNPP, which resulted in replacement and return of failed transmitters to Rosemount for evaluation. Rosemount has confirmed the following seven occurrences; serial numbers 408757, 408759, 408002, and 408003 have not yet been evaluated by Rosemount.

Transmitter 1E31N085A, Serial #406771 (RCIC steam flow) was a Range 7 pressure transmitter (Model 1153GB7) replaced on April 17, 1990. It failed to pass calibration on April 12, 1990 after 27 months at reactor pressure (~ 27,000 psi-mo).

1E31N076B, Serial #408763, (RWCU differential flow) was a Range 5 differential pressure transmitter (Model 1153DB5) replaced on November 6, 1988. It failed to pass calibration on November 5, 1988 after 14.8 months at reactor pressure (~ 15,000 psi-mo).

1E31N083B, Serial #406653, (RCIC steam flow) was a Range 5 differential pressure transmitter (Model 1153DB5) replaced on September 2, 1988. It failed to operate normally during a fill and vent of the transmitter condensing pots on August 30, 1988 after 13.3 months at reactor pressure (~13,000 psi-mo).

1E31N076A, Serial #408000, (RWCU differential flow) was a Range 5 transmitter (Model 1153 DB5) replaced August 16, 1989. It exhibited a change in noise characteristic after 22 months at reactor pressure (~22500 psi-mo).

1E31N077B, Serial #414365, (RWCU differential flow) was a Range 5 transmitter (Model 1153DB5) replaced October 28, 1989. It showed excessive drift after 24 months at reactor pressure (~24500 psi-mo).

1B21N402F, Serial #2986008 (ATWS recirc pump trip on reactor water level) was a Range 5 transmitter (Model 1153DB5) replaced June 25, 1988. It showed excessive drift after 13 months at reactor pressure (~13000 psi-mo).

1B21N091F, Serial #408004 (RPV Level) was a Range 5 transmitter (Model 1153DB5) replaced May 1, 1989. It exhibited drifting greater than expected and was replaced although it had passed its time response test in April 1989. The transmitter had been in-service for 20 months at reactor pressure (~20500 psi-mo).

In addition, for NRC's information, four non-suspect lot transmitters have been removed during the present outage due to potential leakage indications. These four transmitters are listed below.

B21N080A, Serial # 406639, 30 mo @ 1025 psi (~31,000 psi-mo)  
B21N080B, Serial # 406641, 30 mo @ 1025 psi (~31,000 psi-mo)  
B33N014B, Serial # 408419, 30 mo @ 1025 psi (~31,000 psi-mo)  
E31N088D, Serial # 408089, 30 mo @ 1025 psi (~31,000 psi-mo)

These transmitters are being sent to Rosemount for evaluation.

NOTE: Side bar indicates revision from original 7/17/90 letter PY-CEI/NRR-1199L

Basis for Continued PNPP Operation,  
Bulletin 90-01 Action Item Number 5 Response

BULLETIN 90-01:

"Document and maintain in accordance with existing plant procedures a basis for continued plant operation covering the time period from the present until such time that the Model 1153 Series B, 1153 Series D, and Model 1154 transmitters from the manufacturing lots that have been identified by Rosemount as having a high failure fraction due to loss of fill-oil in use in the reactor protection [RPS] or engineered safety features [ESF] actuation systems can be replaced. In addition, while performing the actions requested above, addressees may identify transmitters exhibiting symptoms indicative of loss of fill-oil that do not conform to the established operability acceptance criteria and are not addressed in the technical specifications. As these transmitters are identified, this basis for continued plant operation should be updated to address these transmitters covering the time period from the time these transmitters are identified until such time that these transmitters can be replaced. When developing and updating this basis for continued plant operation, addressees may wish to consider transmitter diversity and redundancy, diverse trip functions (a separate trip function that may also provide a corresponding trip signal), special system and/or component tests, or (if necessary) immediate replacement of certain suspect transmitters."

BASIS FOR CONTINUED OPERATION

In accordance with Requested Action 5 of Bulletin 90-01, this basis for continued PNPP operation addresses those transmitters installed in engineered safety feature actuation systems, which are scheduled for replacement either during third cycle operation or the third refueling outage. There are no subject reactor protection system applications at PNPP.

These transmitters have to date maintained normal calibration accuracy and there is no evidence of degradation in performance or oil loss. The transmitters have also performed normally during plant scrams and transients, and are operable for the third cycle.

Transmitter Operability Verification

Enhanced surveillance continues to verify the continuing reliability of installed Model 1153 transmitters in ESF service. The PNPP enhanced surveillance program corresponds to Bulletin 90-01 Action Item 4 as follows:



- a) Appropriate PNPP personnel have been trained on the symptoms of transmitter failure due to loss of fill fluid. I&C technicians have completed Rosemount training during their continuing training program for 1990 and operations personnel have recently received similar training during operator requalification training.
- b) Enhanced monitoring is accomplished by three methods. These diagnostic procedures are consistent with Rosemount Technical Bulletin Numbers 1 through 4.
  - (1) Rosemount calibration instructions have been changed to address oil loss, including a rapid pressure transient test to 130% of calibrated span.
  - (2) A PC data base is being utilized to trend for cumulative zero shift of all Rosemount model 1153 transmitters.
  - (3) Administrative controls are in place to investigate any instrument calibration data outside its Leave-As-Is-Zone, requiring evaluation for indication of unacceptable trends.
- c) A review of transmitter performance following plant transients is based on available computer points collected from initiating transmitters following a reactor scram.
- d) An enhanced awareness of transmitter response during testing has been achieved by plant I&C instructions and the training referenced in item (a).
- e) Development of a program to detect changes in process noise was not considered at PNPP. It requires a certain amount of process noise not present on the majority of Rosemount transmitters installed. However this testing method may be utilized in troubleshooting where it could be beneficial in diagnosing problems.
- f) Transmitters identified as clearly exhibiting symptoms of loss of fill oil, if the amount of oil loss has or will result in exceeding the limit on drift established by Rosemount Technical Bulletin 4, will be declared inoperable if Technical Specification related. Technical Specification transmitters declared inoperable will have their appropriate actions taken. Transmitters that are not Technical Specification related will be replaced at the earliest appropriate opportunity dependent upon transmitter function and redundancy. Acceptance criteria for making the operability determination are based on Rosemount Technical Bulletin Numbers 1 through 4.

### ESF Actuation and Isolation Functions

ESF systems are listed in PNPP USAR Section 7.3. . Consistent with Standard Review Plan Section 7.3.1, ESF actuation systems include transmitters that detect a plant condition requiring ESF operation and that initiate ESF operation. This discussion therefore applies to the B21N073C, B21N081C and D, B21N075C and D, E31N084B, E31N075B, E12N062B and C, B21N095B, and B21N0402F transmitters tabulated in Attachment 1.

The ESF actuation and isolation instrument channels tabulated in Attachment 1 are arranged in 1-out-of-2-taken-twice logic. For the RCJC initiation function the transmitters are arranged in a 1-out-of-2 logic (RCIC is not an engineered safety feature system). The recirculation pump trip logic (RPT-B21N402) is 2-out-of-2, backed by an independent/redundant division. RPT is also provided independently by reactor vessel steam dome pressure, using transmitters not subject to this Bulletin. These arrangements would require multiple transmitter failures in an unsafe mode (e.g. sluggish response) before a failure to actuate could occur. Replacing the transmitters designated (Attachment 1) further reduces this risk by providing more model diversity.

In addition to maintaining ESF actuation functions with no discernible degradation in the reliability of channels which use Bulletin transmitters, high pressure core spray is initiated by high drywell pressure signals, and other ESF actuations (LPCI B&C, ECC B, ESW B, Division 2 diesel, various HVAC systems) are separately initiated by coincident high drywell pressure/RPV water level signals provided by transmitters not subject to this Bulletin.

### Conclusions

With transmitter diversity and nearly 3 years of successful operation with the Model 1153's in service (~31,000 psi-months), we conclude that the net effect on system availability of leaving the selected Model 1153 transmitters installed is negligible.

It is also noted that replacing all suspect-lot transmitters does not provide 100% reliability; by the selective replacement tabulated (Attachment 1) we can qualify the redesigned transmitters for one fuel cycle (~18000 psi-months) before committing entirely to the new model. Meanwhile, new failure modes that may have been introduced by the new model are also protected against by redundant original transmitters. This approach is at least as conservative as complete replacement.

For the following reasons, we conclude that PNPP can continue to operate as originally licensed with the ESF actuation system Model 1153 transmitters designated in Attachment 1 replaced on the schedule noted:

- (1) Augmented surveillance has verified original transmitter performance characteristics.
- (2) Availability of instrument channels using Model 1153 suspect lot transmitters is statistically improved by length of successful operation, and by selective replacement at the Fall 1990 refuel outage to provide additional diversity.
- (3) Diverse and redundant channels (including high drywell pressure, high reactor steam dome pressure, and replaced RPV level transmitters) are provided to accomplish the same ESF actuation functions provided with the subject Rosemount transmitters, and redundant/diverse emergency coolant injection systems provide additional assurance of core cooling.

This basis for continued operation will be updated if other safety-related Model 1153 transmitters are found to exhibit loss of fill-oil symptoms. If needed, our evaluation will cover the period of time from symptom identification to planned transmitter replacement.

Note: Side bar indicates revision from original 7/17/90 letter, PY-CEI/NRR-1199L.

NJC/CODED/4115