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July 16, 1990
C311-90-2096

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Dear Sir:

Three Mile Island Nuclear Station Unit 1, (TMI-1)
Operating License No. DPR-50
Docket No. 50-289
GPUN Response to NRC Bulletin 90-01
Loss of Fill-Oil in Rosemount Transmitters

This letter transmits GPUN's response to NRC Bulletin 90-01. The actions requested of operating reactors have been completed as appropriate at TMI-1 and the specific actions performed for each of the items are addressed in Attachment 1. The additional attachments provide the information requested to satisfy reporting requirement items 1b) and 1c) as well as data to support the actions taken by GPUN at TMI-1 in regard to failures of Rosemount transmitters resulting from the loss of fill-oil.

No Model 1153 Series B, 1153 Series D, or 1154 transmitters from the manufacturing lots identified by Rosemount as having a high failure fraction due to loss of fill-oil are installed in TMI-1.

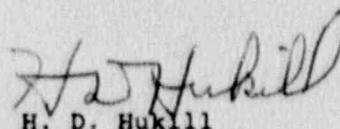
Any future failure or suspected failure due to loss of fill-oil of installed Rosemount Model 1153 Series B, Model 1153 Series D and Model 1154 transmitters manufactured prior to July 11, 1989 will be reported if appropriate. We will also document and maintain in accordance with existing plant procedures information consistent with item 1b) for the Rosemount Model/Series transmitters specified as well as those manufactured after July 11, 1989.

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Preparations have been made to report information consistent with 1b) through the Nuclear Plant Reliability Data System (NPRDS) for those Rosemount Model 1151, 1152, 1153 and 1154 transmitters, within the scope of systems and components that are included in NPRDS, that exhibit symptoms indicative of a loss of fill-oil or are confirmed to have experienced a loss of fill-oil.

Sincerely,

A handwritten signature in dark ink, appearing to read 'H. D. Hukill', written in a cursive style.

H. D. Hukill

Vice President & Director, TMI-1

HDH/WGH

Attachments

cc: R. Hernan
T. Martin
J. Stolz
F. Young

Attachment 1

Requested Actions of Operating Reactors

1. Model 1153 Series B, 1153 Series D, and Model 1154 pressure or differential pressure transmitters, excluding those manufactured subsequent to July 11, 1989, that are currently utilized in either safety-related systems or systems installed in accordance with 10 CFR 50.62 are identified in attachment 2.
2. During the compilation of the listing provided on attachment 2, it was verified that no Model 1153 Series B, 1153 Series D, and 1154 transmitters from the manufacturing lots identified by Rosemount as having a high failure fraction due to loss of fill-oil are installed. Two spare (stock) transmitters identified as being on the "suspect transmitter list" have been returned to Rosemount for rework (replacement of the sensing module).

Spare transmitters manufactured prior to July 11, 1989 are being controlled by placement on a "Warehouse Hold" until such time as they can be returned for rework. Should it become necessary to install a spare transmitter, Plant Engineering will contact Licensing to update the listing of installed transmitters as appropriate.

TMI-1 Plant Engineering contacted Rosemount concerning suspect modules sold as separate replacement parts and was advised that only those utilities supplied sensing modules from the suspect lots were notified of that fact. Having received no notification, GPUN at TMI is confident that no suspect sensing modules are in the TMI-1 warehouse stock. It is also our intention to replace these warehouse stock spares with sensing modules manufactured after July 11, 1989.

3. Plant calibration records for installed transmitters have been reviewed for the model/series differential pressure transmitters to determine whether any of the transmitters may have already exhibited the symptoms indicative of a loss of fill-oil. All available data was examined (in a few cases only one or two data sets exist, while in others, as many as five or six were available for review). The results of the Rosemount 1153 transmitter calibration data search and the results of the analysis of the data are provided in attachment 3.

Calibration history for six transmitters (IC-LT-803, MU14LT, MU-LT-778, MU-FT-1129, NS-LT-800 and NS-LT-801) indicate recurring zero and span shifts. However, since they have all been calibrated satisfactorily

with no apparent response time degradation, capsule failure is considered unlikely. Enhanced monitoring will confirm continued acceptable performance.

Five additional transmitters (MU24APT, MU24BFT, MU24DPT, RC-PT-963, and RC-LT-1037) have not been calibrated often enough (one time or less) to permit data analysis.

- 4a. Both Instrument Technicians and Operations personnel have been made aware of the symptoms of transmitter failure due to the loss of fill-oil. The contents of Bulletin 90-01 were reviewed with the operators and the Instrument Technicians' exposure to the subject of Rosemount transmitter failures is addressed in item 4d) below.
- 4b. Two types of enhanced transmitter monitoring are endorsed by Rosemount in Technical Bulletin 4. They are a) trending operating data and b) trending calibration data.

Trending operating data is a sensitive prediction technique for transmitter failure. The most accurate method is to measure sustained increasing transmitter drift between redundant transmitters. Technical Bulletin 4 also asserts that "using this technique in a non-redundant application is possible if the process variable being measured is known by some other measurement." However, those transmitters identified as being in standby service do not yield useful operating point trend data. In these cases trending calibration data will be necessary.

Attachment 4, page 1 identifies 9 transmitters for operating point trending. Per Technical Bulletin 4 the frequency of the data gathering should be often enough to establish statistically valid trends. Monthly trending should satisfy this criteria for trending operating data. Also from Technical Bulletin 4, the allowable shift for operating data is the zero shift in Table A1 added to the span shift corrected for operating point. Details on the process can be found in the referenced Rosemount Technical Bulletin, page A15.

Attachment 4, page 1, also identifies 8 standby service transmitters requiring calibration. Per Technical Bulletin 4, calibration trending can be done using zero drift calibration data. Therefore a full five point calibration is unnecessary. Because of the redundancy of these applications and absence of safety related actuations, zero checks performed at a quarterly frequency are sufficient. Note that four of the transmitters are operated during quarterly IST tests.

Twelve other transmitters shown on attachment 4, page 2 are either at a low enough static pressure to make fill-oil loss unlikely or do not actuate a safety related function. For these transmitters, plotting control room log readings will provide adequate assurance of correct transmitter operation. This plotting will be performed at least quarterly. If there is reason to suspect a transmitter (e.g. poor performance exhibited by the MU24 transmitters during calibration), plotting frequency can be increased.

NRC Bulletin 90-01 does not require enhanced monitoring for model 1151, 1152 or new 1153 transmitters with 500000 series serial numbers or transmitters in non-safety related applications. Those transmitters falling in these categories at TMI-1 are listed in Attachment 4, page 3. Daily and weekly log reading comparisons will still be performed for these transmitters. No additional monitoring is being considered.

- 4c. Data input to the plant computer by Rosemount transmitters will be reviewed following plant transients. This will be done in a manner similar to that employed to evaluate plant heat-ups and cool-downs via data signal plots.
- 4d. Instrument and Controls Technicians were advised of the circumstances associated with the failure of Rosemount transmitters due to fill-oil loss at the time of issue of the Rosemount Technical Bulletins and IEN 89-42. Since that time, there has been a heightened awareness of the significance of sluggish transmitter response during calibration. A formal training module on the subject of Rosemount transmitter failures will be presented beginning in July and running through August 24, 1990.

TMI-1 personnel are well aware of Rosemount transmitter failures due to fill-oil loss. As identified in attachment 5, five transmitters have been replaced because of failures ultimately determined to be caused by fill-oil loss.
- 4e. Rosemount considers noise data to be difficult to analyze and interpret and will not, therefore, provide general guidelines. The other recommended methods for transmitter evaluation discussed in items 4b and 4c are more effective and sufficient. Noise analysis will not be utilized at TMI-1.
- 4f. Transmitters exhibiting loss of fill-oil symptoms will be investigated and replaced as necessary, in accordance with applicable technical specification requirements. The overall objective shall be to replace

any suspect transmitter as soon as practical. Sufficient spares will be maintained in inventory to accomplish this.

5. No basis for continued plant operation for TMI-1 is necessary since there are no Model 1153 Series B, 1153 Series D, and 1154 transmitters from the manufacturing lots identified by Rosemount as suspect installed in the plant.
6. Details of Rosemount transmitters which previously experienced loss of fill-oil failures are summarized in attachment 5.

Attachment 2

ROSEMOUNT TRANSMITTERS INSTALLED AT TMI-1

Tag	Model	Application	Serial#
BS1-DPT1	1153DD5	RB Spray Flow A	328235
BS1-DPT2	1153DD5	RB Spray Flow B	331754
BS-PT-0981A	1153GD7	Wide Range Containment Pres A	309710
BS-PT-0981B	1153GD5	Narrow Range Contain't Pres A	375420
BS-PT-0982A	1153GD7	Wide Range Containment Pres B	309709
BS-PT-0982B	1153GD5	Narrow Range Contain't Pres B	375421
DH-DPT-0802	1153DD5	Decay Heat Removal Flow A	315522
DH-DPT-0803	1153DD5	Decay Heat Removal Flow B	315523
DH-DPT-0819	1153DD5	BWST/NaOH Δ P	364793
IC-LT-0802	1153DD4	ICCW Tank Level A	356423
IC-LT-0803	1153DB4	ICCW Tank Level B	407010
MU14-LT	1153DD4	Make-Up Tank Level	364785
MU24A-FT	1153HB5	Low Range Make-Up Flow	415198
MU24B-FT	1153HB7	High Range Make-Up Flow	414405
MU42-DPT	1153HB5	RCP Seal Inject'n Flow	415953
MU-LT-0778	1153DD4	Make-Up Tank Level	315514
MU-FT-1126	1153HB6	High Pressure Inject'n Flow	411318
MU-FT-1127	1153HB6	High Pressure Inject'n Flow	411319
MU-FT-1128	1153HB6	High Pressure Inject'n Flow	411320
MU-FT-1129	1153HB6	High Pressure Inject'n Flow	411321
NS-LT-800	1153DD4	NSCCW Surge Tank Level A	356421
NS-LT-801	1153DD4	NSCCW Surge Tank Level B	356422
RC1-LT1	1153HD5	Pressurizer Level	0500493
RC1-LT3	1153HD5	Pressurizer Level	0500491
RC-LT-777	1153DD5	Pressurizer Level	315524
RC-PT-949	1153GD9	RC Wide Range Pressure	312479
RC-PT-963	1153GD9	RC Wide Range Pressure	417568
RC-LT-1037	1153DD5	RCS Draindown Level	364792
SP-LT-775	1153DD5	OTSG A Full Range Level	315519
SP-LT-776	1153DD5	OTSG B Full Range Level	315518
SP-LT-788	1153DD5	OTSG B Full Range Level	315520
SP-LT-789	1153DD5	OTSG A Full Range Level	315521
SP-PT-950	1153GD9	OTSG A Pressure	315570
SP-PT-951	1153GD9	OTSG B Pressure	415256

Attachment 2

ROSEMOUNT TRANSMITTERS INSTALLED AT TMI-1

Tag	Model	Application	Serial#
DH-LT-808	1152DP5	BWST Tank Level	
DH-LT-809	1152DP5	BWST Tank Level	
RC3A-PT1	1152GP9	RC Pressure/RPS A	
RC3A-PT2	1152GP9	RC Pressure/RPS C	
RC3B-PT1	1152GP9	RC Pressure/RPS B	
RC3B-PT2	1152GP9	RC Pressure/RPS D	
CF2-LT1	1151DP5	Core Flood Tank A Level	
CF2-LT2	1151DP5	Core Flood Tank A Level	
CF2-LT3	1151DP5	Core Flood Tank B Level	
CF2-LT4	1151DP5	Core Flood Tank B Level	
CA13-LT	1151DP4	Boric Acid Mix Tank Level	

Attachment 3

Tag #: BS1-dPT1		Model # 1153DD5		S/N 328235		Application REACTOR BUILDING SPRAY (LOOP A)		Static Pressure 100#	
	Date	Zero Error (mA)		Span Error (mA)		Notes		Analysis	
1 st Cal.	2/2/87	0.006		-0.035		Span decrease.		No apparent pattern.	
2 nd Cal.	5/13/87	-0.02		-0.04		No adjustments made.			
3 rd Cal.	1/5/89	-0.027		-0.016					
4 th Cal.	5/7/90	-0.005		0.02		No adjustments made.			
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									

Tag #: BS1-dPT2		Model # 1153DD5		S/N 331754		Application REACTOR BUILDING SPRAY (LOOP B)		Static Pressure 100#	
	Date	Zero Error (mA)		Span Error (mA)		Notes		Analysis	
1 st Cal.	7/28/87	0		0.01		No adjustments made.		No apparent pattern.	
2 nd Cal.	6/8/88	0.038		0.02		Elevated zero.			
3 rd Cal.	2/18/90	-0.037		-0.006					
4 th Cal.									
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									

Tag #: BS-dPT-819		Model # 1153DD5		S/N 364793		Application BWST/NaOH Delta Level		Static Pressure 60 ft	
	Date	Zero Error (mA)		Span Error (mA)		Notes		Analysis	
1 st Cal.	2/27/87	-0.082		0.11		Zero depressed, span increased.		No apparent pattern.	
2 nd Cal.	3/26/88	-0.02		0.01		No adjustments made.			
3 rd Cal.	9/11/89	-0.01		0.07		Span increase.			
4 th Cal.									
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									

Tag #: BS-PT-981A		Model # 1153GD7		S/N 309710		Application WIDE RANGE RX BLDG PRESSURE		Static Pressure 0#	
	Date	Zero Error (mA)		Span Error (mA)		Notes		Analysis	
1 st Cal.	6/11/84	-0.002		0.002				Never found out of tolerance.	
2 nd Cal.	12/25/85	-0.03		-0.02		No adjustments made.			
3 rd Cal.	2/24/87	-0.023		-0.006		No adjustments made.			
4 th Cal.	6/27/88	-0.02		-0.021					
5 th Cal.	11/8/89	-0.006		0.02		No adjustments made.			
6 th Cal.									
7 th Cal.									
8 th Cal.									

ROSEMT1

Tag #: BS-PT-9818 Model # 1153GD5		S/N 375420		Application NARROW RANGE PX BLDG PRESSURE		Static Pressure 0#	
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis			
1 st Cal. 6/15/84	-0.05	0.03	No adjustments made.	No evidence of any type of failure.			
2 nd Cal. 12/29/85	-0.02	0	No adjustments made.				
3 rd Cal. 2/24/87	0.026	-0.02	No adjustments made.				
4 th Cal. 6/27/88	-0.005	0.01	No adjustments made.				
5 th Cal. 11/9/89	-0.01	0.01	No adjustments made.				
6 th Cal.							
7 th Cal.							
8 th Cal.							
Tag #: BS-PT-982A Model # 1153GD7		S/N 309709		Application WIDE RANGE PX BLDG PRESSURE		Static Pressure 0#	
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis			
1 st Cal. 6/15/84	0.005	-0.073	No adjustments made.	No evidence of any type of failure.			
2 nd Cal. 12/25/85	-0.02	-0.08					
3 rd Cal. 2/24/87	0	-0.01	No adjustments made.				
4 th Cal. 6/27/88	0.002	-0.01					
5 th Cal. 11/8/89	-0.005	0.02	No adjustments made.				
6 th Cal.							
7 th Cal.							
8 th Cal.							
Tag #: BS-PT-982B Model # 1153GD5		S/N 375421		Application NARROW RANGE PX BLDG PRESSURE		Static Pressure 0#	
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis			
1 st Cal. 12/28/85	-0.22	0.03	No adjustments made.	No evidence of any type of failure.			
2 nd Cal. 2/24/87	-0.028	-0.02	No adjustments made.				
3 rd Cal. 6/27/88	-0.006	0.02	No adjustments made.				
4 th Cal. 11/9/89	0	0.01	No adjustments made.				
5 th Cal.							
6 th Cal.							
7 th Cal.							
8 th Cal.							
Tag #: DH-dPT-802 Model # 1153UD5		S/N 315522		Application LOW PRESSURE INJECTION FLOW		Static Pressure 400#	
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis			
1 st Cal. 11/2/85	-0.48	0.25	Zero depressed, span increased.	No apparent pattern.			
2 nd Cal. 4/9/86	0.005	0.008	No adjustments made.				
3 rd Cal. 1/21/87	0.001	0.01	No adjustments made.				
4 th Cal. 7/19/88	0.029	0.1	Zero elevated, span increased.				
5 th Cal. 10/14/89	-0.021	-0.51	Zero depressed.				
6 th Cal.							
7 th Cal.							
8 th Cal.							

P05EMT2

Attachment 3

Tag # DH-JPT-803 Model # 1153005				Application LOW PRESSURE INJECTION FLOW		Static Pressure 400#		
Date	Zero Error (mA)	S/N 31523	Span Error (mA)	Notes	Analysis			
1 st Cal. 11/4/85	0.0004		0.13	Span increase. No adjustments made.	No apparent pattern.			
2 nd Cal. 3/25/86	-0.012		-0.007					
3 rd Cal. 1/12/87	-0.005		-0.032					
4 th Cal. 7/19/88	-0.01		-0.025					
5 th Cal. 10/14/89	-0.009		-0.017					
6 th Cal.								
7 th Cal.								
8 th Cal.								
Tag # IC-LT-802 Model # 1153004				Application IC SURGE TANK LEVEL		Static Pressure 100#		
Date	Zero Error (mA)	S/N 356423	Span Error (mA)	Notes	Analysis			
1 st Cal. 7/27/84	0.026		-0.034	Zero depressed. Zero depressed. No adjustments made. Span decrease.	No apparent pattern.			
2 nd Cal. 2/10/86	-0.381		-0.415					
3 rd Cal. 2/9/87	-0.07		-0.041					
4 th Cal. 4/16/88	0.001		0					
5 th Cal. 9/26/89	-0.01		-0.055					
6 th Cal.								
7 th Cal.								
8 th Cal.								
Tag # IC-LT-803 Model # 1153004				Application IC SURGE TANK LEVEL		Static Pressure 100#		
Date	Zero Error (mA)	S/N 407010	Span Error (mA)	Notes	Analysis			
1 st Cal. 7/27/84	-0.17		-0.237	Zero depressed, span decreased. Zero depressed. Span increase. No adjustments made. Zero depressed, span decreased.	Possible capsule failure based on repeated zero and span decreases. Low static pressure may be prolonging effects.			
2 nd Cal. 2/11/86	-0.43		-0.553					
3 rd Cal. 2/9/87	-0.02		0.08					
4 th Cal. 4/16/88	0.028		-0.009					
5 th Cal. 9/26/89	-0.07		-0.137					
6 th Cal.								
7 th Cal.								
8 th Cal.								
Tag # MU14LT Model # 1153004				Application MAKE UP TANK LEVEL		Static Pressure 100#		
Date	Zero Error (mA)	S/N 364785	Span Error (mA)	Notes	Analysis			
1 st Cal. 9/25/86	1.358		1.48	Zero elevated, span increased. Elevated zero Elevated zero.	Possible capsule failure based on repeated large zero shifts in the same direction. Low static pressure may be prolonging effects.			
2 nd Cal. 1/7/88	1.58		1.53					
3 rd Cal. 7/1/89	0.045		0.09					
4 th Cal.								
5 th Cal.								
6 th Cal.								
7 th Cal.								
8 th Cal.								

ROSEMT3

Attachment 3

Tag #	Model #	S/N	Application	Static Pressure
MU24AFT	1153HB5	415198	LOW RANGE MAKE UP FLOW	2200#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis
1 st Cal. 9/3/87				
2 nd Cal. 10/4/87	0.111	0.13	Replaced transmitter. Zero elevated, span increased.	Not enough data for analysis.
3 rd Cal.				
4 th Cal.				
5 th Cal.				
6 th Cal.				
7 th Cal.				
8 th Cal.				
Tag #	Model #	S/N	Application	Static Pressure
MU24BFT	1153HB7	414405	HIGH RANGE MAKE UP FLOW	2200#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis
1 st Cal. 5/13/86	-0.011	0.22	Zero depressed, span increased.	Not enough data for analysis.
2 nd Cal.				
3 rd Cal.				
4 th Cal.				
5 th Cal.				
6 th Cal.				
7 th Cal.				
8 th Cal.				
Tag #	Model #	S/N	Application	Static Pressure
MU42dPT	1153HD5	415953	RCP SEAL INJECTION FLOW	2200#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis
1 st Cal. 10/11/85				
2 nd Cal. 1/1/86			Replaced transmitter.	None possible. No data.
3 rd Cal. 2/1/89			Replaced transmitter.	
4 th Cal.			Replaced transmitter.	
5 th Cal.				
6 th Cal.				
7 th Cal.				
8 th Cal.				
Tag #	Model #	S/N	Application	Static Pressure
MU-LT-778	1153DD4	315514	MAKE UP TANK LEVEL	100#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis
1 st Cal. 1/11/85	-0.01	-0.02	No adjustments made.	Possible capsule failure based
2 nd Cal. 9/25/86	-0.014	-0.01	No adjustments made.	on increasing zero and span
3 rd Cal. 1/1/88	-0.014	-0.038	No adjustments made.	negative deviations. Low static
4 th Cal. 6/30/89	-0.052	-0.042	Zero depressed.	pressure may be prolonging
5 th Cal.				effects.
6 th Cal.				
7 th Cal.				
8 th Cal.				

ROSEMT4

Tag #: MU-FT-1126 Model # 1153HB6				S/N 411318		Application HIGH PRESSURE INJECTION FLOW		Static Pressure 2800#	
Date				Span Error (mA)		Notes		Analysis	
1 st Cal.	3/25/86	Zero Error (mA)	0.022	0		No adjustments made.		No apparent pattern.	
2 nd Cal.	2/23/87		0.044	0.09		Elevated zero.			
3 rd Cal.	5/3/88		0.056	0.045		Zero depressed.			
4 th Cal.	10/9/89		-0.025	0.03		No adjustments made.			
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									
Tag #: MU-FT-1127 Model # 1153HB6				S/N 411319		Application HIGH PRESSURE INJECTION FLOW		Static Pressure 2800#	
Date				Span Error (mA)		Notes		Analysis	
1 st Cal.	4/9/86	Zero Error (mA)	-0.016	-0.03		No adjustments made.		No apparent pattern.	
2 nd Cal.	2/2/87		-0.018	-0.01		Elevated zero.			
3 rd Cal.	5/5/88		0.341	0.34		No adjustments made.			
4 th Cal.	10/12/89		-0.016	-0.008		No adjustments made.			
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									
Tag #: MU-FT-1128 Model # 1153HB6				S/N 411320		Application HIGH PRESSURE INJECTION FLOW		Static Pressure 2800#	
Date				Span Error (mA)		Notes		Analysis	
1 st Cal.	3/21/86	Zero Error (mA)	0.026	0.005		No adjustments made.		No apparent pattern.	
2 nd Cal.	2/22/87		0.003	0.02		No adjustments made.			
3 rd Cal.	5/9/88		0.053	0.04		Elevated zero.			
4 th Cal.	10/12/89		-0.002	-0.02		No adjustments made.			
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									
Tag #: MU-FT-1129 Model # 1153HB6				S/N 411321		Application HIGH PRESSURE INJECTION FLOW		Static Pressure 2800#	
Date				Span Error (mA)		Notes		Analysis	
1 st Cal.	3/27/86	Zero Error (mA)	0.17	0.208		Elevated zero.		Possible capsule failure based on repeated zero and span shifts in the same direction.	
2 nd Cal.	2/22/87		0.073	0.05		Elevated zero.			
3 rd Cal.	6/24/88		0.064	0.175		Zero elevated, span increased.			
4 th Cal.	10/13/89		-0.018	0.07		Span increased.			
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									

ROSEMTS

Attachment 3

Tag #: NS-LT-800		Model # 1153DB4	S/N 356421	Application NUCLEAR SERVICES CLOSED COOLING	Static Pressure 100#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis	
1 st Cal. 7/27/84	-0.152	-0.138	Zero depressed.	Large zero and span shifts	
2 nd Cal. 2/2/86	0.537	0.46	Zero elevated, span increased.	but in opposite direction of	
3 rd Cal. 2/9/87	-0.69	-0.62	Zero depressed.	previous cal. suggesting that	
4 th Cal. 4/17/88	0.002	0	No adjustments made.	capsule failure is not the	
5 th Cal. 9/26/89	0.237	0.237	Zero elevated, span increased.	cause (would expect shifts	
6 th Cal.				to be in same direction if	
7 th Cal.				capsule is failing).	
8 th Cal.					

Tag #: NS-LT-801		Model # 1153DB4	S/N 356422	Application NUCLEAR SERVICES CLOSED COOLING	Static Pressure 100#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis	
1 st Cal. 7/27/84	0.007	0.03	No adjustments made.	Would suspect capsule failure	
2 nd Cal. 2/2/86	0.58	0.44	Zero elevated, span increased.	possible based on repeated	
3 rd Cal. 2/9/87	-0.6	-0.682	Zero depressed.	zero and span shifts in the	
4 th Cal. 4/17/88	0.012	0.01	No adjustments made.	same direction, but 3rd cal.	
5 th Cal. 9/26/89	0.069	0.09	Elevated zero.	data does not support.	
6 th Cal.					
7 th Cal.					
8 th Cal.					

Tag #: RC-LT-777		Model # 1153DB5	S/N 315524	Application PRESSURIZER LEVEL	Static Pressure 2200#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis	
1 st Cal. 5/17/84	-0.06	-0.015	No adjustments made.	No apparent pattern.	
2 nd Cal. 5/18/85	-0.49	-0.42	Zero depressed.		
3 rd Cal. 12/18/86	-0.15	0.2	Zero depressed, span increased.		
4 th Cal. 6/22/88	0.016	0.014	No adjustments made.		
5 th Cal. 11/13/89	-0.001	0.04	Span increase.		
6 th Cal.					
7 th Cal.					
8 th Cal.					

Tag #: RC-PT-949		Model # 1153GD9	S/N 312479	Application WIDE RANGE RC PRESSURE (LOOP A)	Static Pressure 2200#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis	
1 st Cal. 2/10/82	-0.387	0.05	Zero depressed, span increased.	No apparent pattern.	
2 nd Cal. 8/22/84	0	0.03	No adjustments made.		
3 rd Cal. 4/12/86	0.114	0.182	Zero elevated, span increased.		
4 th Cal. 2/21/87	0.033	0.051	Elevated zero.		
5 th Cal. 2/12/90	0	0.03	No adjustments made.		
6 th Cal.					
7 th Cal.					
8 th Cal.					

ROSEMT6

Attachment 3

Tag #: RC-PT-963 Model # 1153GD9 S/N 417568				Application WIDE RANGE RC PRESSURE (LOOP B)	Static Pressure 2200#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis	
1 st Cal. 1/21/82	0.005	-0.027			Not enough data.
2 nd Cal. 8/22/84	0.1	0.06	Elevated zero.		
3 rd Cal. 4/12/86	-0.046	-0.018	Zero depressed.		
4 th Cal. 2/21/87	-0.035	-0.054	Zero depressed.		
5 th Cal. 11/27/89			Replaced transmitter		
6 th Cal. 2/12/90	0.013	-0.012	No adjustments made.		
7 th Cal.					
8 th Cal.					

Tag #: RC-LT-1037 Model # 1153DD5 S/N 364792				Application REACTOR VESSEL DRAINDOWN LEVEL	Static Pressure 0#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis	
1 st Cal. 7/18/88	0.007	0.01			Not enough data.
2 nd Cal.			No adjustments made.		
3 rd Cal.					
4 th Cal.					
5 th Cal.					
6 th Cal.					
7 th Cal.					
8 th Cal.					

Tag #: SP-LT-775 Model # 1153DD5 S/N 315519				Application OTSG A FULL RANGE LEVEL	Static Pressure 885#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis	
1 st Cal. 6/5/83	-0.08	0.083			No apparent pattern.
2 nd Cal. 9/28/84	0	0.02	Zero depressed.		
3 rd Cal. 3/31/86	0.03	0.02	No adjustments made.		
4 th Cal. 2/22/87	0.02	0.1	No adjustments made.		
5 th Cal. 2/8/90	-0.064	0.027	Span increase.		
6 th Cal.			Zero depressed.		
7 th Cal.					
8 th Cal.					

Tag #: SP-LT-776 Model # 1153DD5 S/N 315518				Application OTSG A FULL RANGE LEVEL	Static Pressure 885#
Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis	
1 st Cal. 6/13/83	0.16	-0.116			No apparent pattern.
2 nd Cal. 10/1/84	0	0.029	Zero depressed, span decreased.		
3 rd Cal. 4/1/86	0.04	0	No adjustments made.		
4 th Cal. 2/22/87	-0.42	0.049	No adjustments made.		
5 th Cal. 7/3/88	0.02	-0.01	Zero elevated, span increased.		
6 th Cal. 1/25/90	0.24	-0.128	No adjustments made.		
7 th Cal.			Zero depressed, span decreased.		
8 th Cal.					

ROSEMT7

Attachment 3

Tag #	SP-LT-788	Model #	1153DD5	S/N	315520	Application	OTSG B FULL RANGE LEVEL	Static Pressure	885#
	Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis				
1 st Cal.	6/13/83	-0.04	-0.011	Zero depressed.	No apparent pattern.				
2 nd Cal.	10/1/84	0	0.032	No adjustments made.					
3 rd Cal.	4/1/86	-0.03	-0.02	No adjustments made.					
4 th Cal.	3/1/87	-0.08	-0.07	Zero depressed.					
5 th Cal.	6/2/88	0.01	-0.01	No adjustments made.					
6 th Cal.	11/21/89	0.07	0.06	Elevated zero.					
7 th Cal.									
8 th Cal.									

Tag #	SP-LT-789	Model #	1153DD5	S/N	315521	Application	OTSG B FULL RANGE LEVEL	Static Pressure	885#
	Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis				
1 st Cal.	9/28/84	0.024	0.015		No apparent pattern.				
2 nd Cal.	4/1/86	-0.07	0.01	Zero dpressed, span increased.					
3 rd Cal.	3/1/87	-0.01	0.06	Span increased.					
4 th Cal.	11/20/89	-0.01	0						
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									

Tag #	SP-PT-950	Model #	1153GD9	S/N	315570	Application	OTSG A PRESSURE	Static Pressure	885#
	Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis				
1 st Cal.	2/4/87			Replaced transmitter.	No apparent pattern.				
2 nd Cal.	7/22/88	-0.018	-0.038	No adjustments made.					
3 rd Cal.	2/17/90	-0.1	-0.09	Zero depressed.					
4 th Cal.									
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									

Tag #	SP-PT-951	Model #	1153GD9	S/N	415256	Application	OTSG B PRESSURE	Static Pressure	885#
	Date	Zero Error (mA)	Span Error (mA)	Notes	Analysis				
1 st Cal.	2/5/87			Replaced transmitter.	No apparent pattern.				
2 nd Cal.	7/22/88	0.022	-0.01	No adjustments made.					
3 rd Cal.	2/17/90	0.06	0.09	Elevated zero.					
4 th Cal.									
5 th Cal.									
6 th Cal.									
7 th Cal.									
8 th Cal.									

ROSEMTB

Attachment 4

THI-1 ROSEMOUNT TRANSMITTERS - OPERATING PCINT TRENDING

INSTRUMENT TAG NUMBER	APPLICATION/FUNCTION	MODEL NUMBER	SAFETY CLASS.	CALIBRATED RANGE	STATIC PRESSURE	TRANSMITTER LOCATION	CONT. ROOM INDICATOR	COMPUTER POINT	REMARKS
MS-PT-0950	OTSG A PRESSURE/MSPS INPUT, FEED. ISOLATION, REG. GUIDE 1.97	1153009	1	0 - 1200 psig	865	RB 308*	NONE	A0013	CATEGORY 1, WEEKLY
MS-PT-0951	OTSG B PRESSURE/MSPS INPUT, FEED. ISOLATION, REG. GUIDE 1.97	1153009	1	0 - 1200 psig	865	RB 308*	NONE	A0017	CATEGORY 1, WEEKLY
MUA2-DPT	RC PUMP SEAL INJECTION FLOW/ROP TRIP	1153H05	1	0 - 392 in. H2O	2800	AB 281*	MUA2-F1	NONE	CATEGORY 2, TWO PREVIOUS OIL LEAKS
MS-LT-0800	WSCM SURGE TANK LEVEL A/CONT. ISOLATION	1153004	1	29 - 149 in. H2O	100	FHB 348*	LI-800	A0453	WEEKLY
MS-LT-0801	WSCM SURGE TANK LEVEL B/CONT. ISOLATION	1153004	1	29 - 149 in. H2O	100	FHB 348*	LI-801	A0454	WEEKLY
IC-LT-0802	ICCM TANK LEVEL A/CONT. ISOLATION	1153004	1	10 - 35 in. H2O	100	FHB 348*	LI-802	A0451	WEEKLY
IC-LT-0803	ICCM TANK LEVEL B/CONT. ISOLATION	1153004	1	10 - 35 in. H2O	100	FHB 348*	LI-802	A0452	WEEKLY
RC-PT-0949	RC WIDE RANGE PRESSURE/SAT. MARGIN REG. GUIDE 1.97	1153009	1	0 - 3000 psig	2200	RB 346*	PI-949, 949A	NONE	CATEGORY 1, WEEKLY
RC-PT-0903	RC WIDE RANGE PRESSURE/SAT. MARGIN REG. GUIDE 1.97	1153009	1	0 - 3000 psig	2200	RB 346*	PI-943	A0404	CATEGORY 1, WEEKLY
STANDBY SERVICE - ZERO SHIFT CHECK									
MU-FI-1126	HIGH PRESSURE INJECTION FLOW REG. GUIDE 1.97	1153H06	1	0 - 970 in. H2O	2800	AB 281*	FI-1126	A0534	CATEGORY 1, STBY SVC. FOX. SPEC 200 CUTOFF
MU-FI-1127	HIGH PRESSURE INJECTION FLOW REG. GUIDE 1.97	1153H06	1	0 - 970 in. H2O	2800	AB 281*	FI-1127	A0535	CATEGORY 1, STBY SVC. FOX. SPEC 200 CUTOFF
MU-FI-1128	HIGH PRESSURE INJECTION FLOW REG. GUIDE 1.97	1153H06	1	0 - 970 in. H2O	2800	AB 305*	FI-1128	A0536	CATEGORY 1, STBY SVC. FOX. SPEC 200 CUTOFF
MU-FI-1129	HIGH PRESSURE INJECTION FLOW REG. GUIDE 1.97	1153H06	1	0 - 945 in. H2O	2800	AB 305*	FI-1129	A0537	CATEGORY 1, STBY SVC. FOX. SPEC 200 CUTOFF
DH-DPT-0802	DECAY HEAT REMOVAL FLOW A REG. GUIDE 1.97	1153005	1	0 - 600 in. H2O	400	AB 261*	FI-802, 802A	A0905	CATEGORY 1, STBY SVC. QUARTERLY 1ST, WEEKLY
DH-DPT-0803	DECAY HEAT REMOVAL FLOW B REG. GUIDE 1.97	1153005	1	0 - 600 in. H2O	400	AB 261*	FI-803, 803A	A0906	CATEGORY 1, STBY SVC. QUARTERLY 1ST, WEEKLY
BS10PT1	RB SPRAY FLOW A/REG. GUIDE 1.97	1153005	2	0 - 300 in. H2O	100	AB 261*	BS1-F11	NONE	CATEGORY 2, STBY SVC. QUARTERLY 1ST, WEEKLY
BS10PT2	RB SPRAY FLOW B/REG. GUIDE 1.97	1153005	2	0 - 300 in. H2O	100	AB 261*	BS1-F12	NONE	CATEGORY 2, STBY SVC. QUARTERLY 1ST, WEEKLY

Attachment 4

THI-1 ROBERTSON TRANSMITTERS - LOG READING COMPARISONS

INSTRUMENT TAG NUMBER	APPLICATION/FUNCTION	MODEL NUMBER	SAFETY CLASS.	CALIBRATED RANGE	STATIC PRESSURE	TRANSMITTER LOCATION	CONT. ROOM INDICATOR	COMPUTER POINT	REMARKS
SP-LT-0775	OTSG A FULL RANGE LEVEL REG. GUIDE 1.97	1153005	1	22 - 634 in. H2O	885	RB 281' LI-775A, 775B	NONE	NONE	CATEGORY 1, WEEKLY
SP-LT-0776	OTSG B FULL RANGE LEVEL REG. GUIDE 1.97	1153005	1	22 - 634 in. H2O	885	RB 281' LI-776A, 776B	NONE	NONE	CATEGORY 1, WEEKLY
SP-LT-0788	OTSG B FULL RANGE LEVEL REG. GUIDE 1.97	1153005	1	22 - 634 in. H2O	885	RB 281' LI-788A, 788B	NONE	NONE	CATEGORY 1, WEEKLY
SP-LT-0789	OTSG A FULL RANGE LEVEL REG. GUIDE 1.97	1153005	1	22 - 634 in. H2O	885	RB 281' LI-789A, 789B	NONE	NONE	CATEGORY 1, WEEKLY
RC-LT-0777	PRESSURIZER LEVEL, PRESSURE BOUNDARY REG. GUIDE 1.97	1153005	1	6 - 406 in. H2O	2200	RB 281' LI-777, 777A	NONE	NONE	CATEGORY 2, WEEKLY, DAILY
RU14-LT	MAKEUP TANK LEVEL REG. GUIDE 1.97	1153004	1	18 - 118 in. H2O	100	FHB 281' RU14-LR	A0400	A0400	CATEGORY 2, DAILY
RU-LT-0778	MAKEUP TANK LEVEL/REG. GUIDE 1.97	1153004	1	26 - 126 in. H2O	100	FHB 281' LI778, 778A	A0626	A0626	CATEGORY 2, DAILY
BS-DPT-0819	BMST - ROOM DIFFERENTIAL PRESSURE/ PRESSURE BOUNDARY	1153005	1	0 - 150 in. H2O	2	YARD	NONE	A0671	DAILY
BS-PT-0981A	WIDE RANGE CONTAINMENT PRESSURE, REG. GUIDE 1.97	1153007	1	0 - 175 psig	0	AB 305'	PR 981	A0455	CATEGORY 1, WEEKLY
BS-PT-0982A	WIDE RANGE CONTAINMENT PRESSURE, REG. GUIDE 1.97	1153007	1	0 - 175 psig	0	AB 305'	PR 981	A0457	CATEGORY 1, WEEKLY
BS-PT-0981B	NARROW RANGE CONTAINMENT PRESSURE, REG. GUIDE 1.97	1153005	1	-5 - 5 psid	0	AB 305'	PR 981	NONE	CATEGORY 1, WEEKLY
BS-PT-0982B	NARROW RANGE CONTAINMENT PRESSURE, REG. GUIDE 1.97	1153005	1	-5 - 5 psid	0	AB 305'	PR 981	NONE	CATEGORY 1, WEEKLY

Attachment 4
TMI-1 ROSENBLUTH TRANSMITTERS

INSTRUMENT TAG NUMBER	APPLICATION/FUNCTION	MODEL NUMBER	SAFETY CLASS.	CALIBRATED RANGE	STATIC PRESSURE	TRANSMITTER LOCATION	CONT. ROOM INDICATOR	COMPUTER POINT	REMARKS
RC1-LT1	PRESSURIZER LEVEL/PZR. SPRAY, MAKEUP, REG. GUIDE 1.97	1153HD5	1	0 - 400 IN. H2O	2200	RB 281*	RC1-L11, LR	A0501	CATEGORY 2, DAILY NEW (5000 SERIES)
RC1-LT3	PRESSURIZER LEVEL/PZR. SPRAY, MAKEUP, REG. GUIDE 1.97	1153HD5	1	0 - 400 IN. H2O	2200	RB 281*	RC1-L11, LR	A0503	CATEGORY 2, DAILY NEW (5000 SERIES)
RC3A-P11	RC PRESSURE/RPS A	1152GP9	1	1700 - 2500 psig	2200	RB 346*	RC3A-PR	A0586	DAILY
RC3A-P12	RC PRESSURE/RPS C	1152GP9	1	1700 - 2500 psig	2200	RB 346*	NONE	A0587	DAILY
RC3B-P11	RC PRESSURE/RPS B	1152GP9	1	1700 - 2500 psig	2200	RB 346*	RC3B-PR	A0588	DAILY
RC3B-P12	RC PRESSURE/RPS D	1152GP9	1	1700 - 2500 psig	2200	RB 346*	NONE	A0589	DAILY
CF2-LT1	CF TANK A LEVEL/ESAS, REG. GUIDE 1.97	1151DP5	1	13 - 185 IN. H2O	700	RB 308*	CF2-L11	A0480	CATEGORY 3, DAILY
CF2-LT2	CF TANK A LEVEL/ESAS, REG. GUIDE 1.97	1151DP5	1	13 - 185 IN. H2O	700	RB 308*	CF2-L12	A0481	CATEGORY 3, DAILY
CF2-LT3	CF TANK B LEVEL/ESAS, REG. GUIDE 1.97	1151DP5	1	13 - 185 IN. H2O	700	RB 308*	CF2-L13	A0482	CATEGORY 3, DAILY
CF2-LT4	CF TANK B LEVEL/ESAS, REG. GUIDE 1.97	1151DP5	1	13 - 185 IN. H2O	700	RB 308*	CF2-L14	A0483	CATEGORY 3, DAILY
CA13-LT	BORIC ACID MIX TANK LEVEL	1151DP4	1	0 - 129 IN. H2O	0	AB 331*	CA13-L1	A0475	
DN-LT-808	BWSY TANK LEVEL	1152DP5	1	52 - 774 IN. H2O	0	YARD	L1808, 808A	A0486	WEEKLY, DAILY
DH-LT-809	BWST TANK LEVEL	1152DP5	1	52 - 774 IN. H2O	0	YARD	L1809, 809A	A0487	WEEKLY, DAILY
HL24A-F1	LOW RANGE MAKEUP FLOW/PRESSURE BOUNDARY, REG. GUIDE 1.97	1153HB5	2	0 - 250 in. H2O	2800	FHB 281*	HL24A/B-F1	A0500	CATEGORY 2
HL24B-F1	HIGH RANGE MAKEUP FLOW/PRESSURE BOUNDARY, REG. GUIDE 1.97	1153HB7	2	0 - 255 psid	2800	FHB 281*	HL24A/B-F1	A0100	CATEGORY 2
RC-LT-1037	RCS DRAINDOWN LEVEL	1153DD5	2	322- 411 in. H2O	0	RB 281*	L1-1037	NONE	TO BE CALIBRATED BEFORE DRAINDOWN, NORMALLY VALVED OUT

Rosemount 1153/1154 Transmitters Installed at TMI-1 That Experienced Loss of Fill-Oil Failures

Tag No.	Model No.	Serial No.	Application	Approx Time at Pressure (Months)	Corrective Action	Disposition
MU42DPT	1153HB5PA	411633	RPC Seal Injection Flow	8	Replaced	Rosemount Failure Analysis confirmed loss of fill-oil from cell cup to glassing seal.
MU42DPT	1153H05PA	412708	RPC Seal Injection Flow	2	Replaced	Rosemount Failure Analysis confirmed loss of fill-oil from fill tube to glass seal.
MU42AFT	1153HB5PC	414540	Low Range Makeup Flow	10	Replaced	Rosemount confirmed loss of fill-oil from the low side module.
MU42DPT	1153HB5RA	414415	RCP Seal Injection Flow	27	Replaced	Rosemount Field Return confirmed loss of fill-oil from hole in the high side fill tube weld joint.
MU42DPT	1153HB5RA	415199	RCP Seal Injection Flow	3	Replaced	Rosemount Field Return Analysis confirmed loss of fill-oil from the low side isolator weld.