LIS ORIGINAL

SSINS No.: 6820
Accession No.:
8005050066

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

June 27, 1980

IE Bulletin No. 80-16

POTENTIAL MISAPPLICATION OF ROSEMOUNT INC. MODELS 1151 AND 1152 PRESSURE TRANSMITTERS WITH EITHER "A" OR "D" OUTPUT CODES

Description of Circumstances

The NRC has recently been advised through 10 CFR 21 reports that a potential misapplication problem exists on Rosemount Inc. Models 1151 and 1152 pressure transmitters with either "A" or "D" output codes. The pressure transmitters are used in both pressure and differential pressure applications. Applications include pressurizer pressure monitoring (pressure transmitters) and reactor vessel level monitoring (differential pressure transmitters).

The potential misapplication problem occurs when the above specified transmitters are exposed to excessive over or reverse pressures. These pressures can result in ambiguous signal outputs from the transmitter to control and/or indication components. These ambiguous signals could result in erroneous control action, such as an open signal to a solenoid valve rather than a closed signal, or an erroneous indication signal, such as an indication in the normal operating range when a pressure outside the normal range actually exists.

Enclosure 1 contains Rosemount Inc.'s technical description of the potential application problems for Pressure Transmitters Model 1152. This information is applicable to Model 1151 Pressure Transmitters also. This information includes the reasons for the maloperation of the transmitters, a typical pressure versus current output curve and examples of the results of the mal-operations. Available information indicates that the problem was reported to each customer who was furnished the subject transmitters by Rosemount Inc.

Actions to be Taken by Licensees of Power Reactor Operating Facilities and Holders of Construction Permits:

1. Determine if your facility has installed or plans to install Rosemount Inc. Model 1151 or 1152 pressure transmitters with output codes "A" or "D" in any safety-related application.

2. If it is determined that your facility has the transmitters described in 1 above in any safety-related application, determine whether they can be exposed to input pressures that could result in anomalous output signals during normal operation, anticipated transients or design bases accidents. If the affected transmitters can be exposed to input pressures that could result in anomalous output signals, perform a worst case analysis to determine whether the anomalous signals could result in violating any

design basis assumption. The safety-related application shall include control, protective or indication functions. If any safety-related application does not conform to the above requirements address the basis for continued plant operation until the problem is resolved and provide an analysis of all potential adverse system effects which could occur as a result of a postulated pressure transmitter maloperation described in Enclosure 1 of this bulletin. In each instance, the analysis should include the effects of postulated transmitter maloperation as it relates to indication, control and protective functions. The analysis shall address both incorrect automatic system operation and incorrect operator actions caused by erroneous indications. Address the conformance to IEEE 279, Section 4.20 in your analysis. Include in your analysis the following table:

a. Complete model number.
b. Transmitter range limits.
c. Transmitter range setting.
d. Range of process variable measured for (1) normal and (2) accident conditions.
e. Values of process variable which could produce anomalous indication based upon your evaluation.
f. Service/function.

3. Submit a complete description of all corrective actions required as a result of your analysis and evaluations, together with the schedule for accomplishing the corrective actions.

4. Provide the response in writing within 30 days for facilities holding an operating license or are NTOL applicants* and within 60 days for those facilities holding construction permits. Reports shall be submitted to the Director of the appropriate NRC Regional Office with copies forwarded to the U.S. Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Reactor Operations Inspection (for facilities holding an operating license) or Division of Reactor Construction Inspection (for facilities holding a construction permit), Washington, D.C. 20555.

* The plants that are the subject of the near term operating license reviews are: North Anna 2, Salem 2, Sequoyah 1 & 2, McGuire 1 & 2, Diablo 1 & 2, and Zimmer.

Approved by GAO, B180225 (R0072); clearance expires July 31, 1980. Approval was given under a blanket clearance specifically for identified generic problems.

Enclosure:
Extract from Rosemount Inc.
letter to NRC dated June 6, 1980

EXTRACT FROM ROSEMOUNT, INC.
LETTER TO NRC DATED JUNE 6, 1980

(i) Name and address of the individual or individuals informing the Commission.

Not Applicable.

(ii) Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States which is affected by the potential application problem.

Rosemount Model 1152 Pressure Transmitters with output codes "A" or "D".

(iii) Identification of the firm making the report.

Rosemount Inc. 12001 W. 78th St.
Eden Prairie, MN. 55344

(iv) Nature of the potential applications problem.

Rosemount's Model 1152 pressure transmitter provides a specified linear output of 4 to 20 mA throughout the calibrated range of operation. The transmitter output is not specified by Rosemount for pressures outside of the calibrated range of operation. It has been observed in a limited number of transmitters that an output between 4 and 20 mA can occur with certain input pressures outside of the calibrated range. These ambiguous outputs can occur in both an over pressure condition and a reverse pressure condition. Both conditions arise when the center diaphragm of the pressure sensor bottoms out against either of the fixed capacitor plates. In each case the normal capacitance signal becomes a very high capacitance signal which affects the operation of the electronic circuit.

For the over pressure condition, the effect of the high capacitance from the sensor is a modulated output on the oscillator circuit which may cause the output current of the transmitter to drop below 20 mA. In a limited sample size, the ambiguous output during this over pressure condition occurred in 5% of the transmitters at ambient conditions. Referring to the attached graph, this does not occur until the over pressure condition is $\geq$ 140% of the upper range limit regardless of span. At that point a discontinuity can occur with the output current instantaneously decreasing to less than 20 mA. As an example of this potential applications problem, the upper range limit of a range 5 1152 differential pressure transmitter (Model 1152DP5A22) is 750"H_2O. The range of this pressure transmitter can be set from 0 to 150"H_2O. If the ambiguous output in the over pressure condition is to occur, it will occur at 140% or more of the upper range limit or, in this case, at pressures $\geq$ 1050"H 0 (750"H_2O x 1.4). The transmitter then could give an output less than 20 mA at a pressure that is, in this example, seven

times (1050"H_2O ÷ 150"H_2O) the upper range value. Note that the significant figure for use in determining the pressure above which an ambiguous output can occur is the specified upper range limit (750" H_2O in this example) not the customer selected upper range value (150"H_2O in this example).

For the reverse pressure condition, the effect of the high capacitance from the sensor is the oscillator circuit drawing more current which may cause the output current of the transmitter to exceed 4 mA. In a limited sample size, the ambiguous output during this reverse pressure condition occurred in 55% of the transmitters at ambient conditions. Referring to the attached graph, this does not occur until the reverse pressure condition exceeds 140% of the upper range limit regardless of the span. At this point the output may exceed 4 mA. As an example of this potential applications problem consider the range 5 differential transmitter in the previous paragraph. If the ambiguous output in the reverse pressure condition is to occur, it will occur at 140% or more of the upper range limit, or in this case at reversed pressures $\geq$ 1050" H_2O (750"H O x 1.4). The transmitter then could give an output greater than 4 mA at a pressure that is, in this example, seven times (1050" H_2O ÷ 150" H_2O) the upper range value, but reversed. Also note that with absolute pressure units a reverse pressure is not possible since the low pressure side of the cell is evacuated. With gage units a reverse pressure is possible only if a vacuum is present on the connected part since the low pressure side of the cell is vented to ambient atmosphere. Since the maximum reverse pressure would be one atmosphere, only range 3 and 4 gage units could obtain a reverse pressure exceeding 140% of the upper range limit.

Due to the effects of radiation or elevated temperature, we believe that the frequency of occurrence of the ambiguous output will be greater in a radiated or an elevated temperature environment than was experienced in our limited sample size testing, which was in a non-radiated ambient temperature environment.

After the occurrence of an ambiguous output from an over pressure or a reverse pressure condition, the transmitter will return to specified operation when the input pressure returns to the calibrated range, provided the over pressure or reverse pressure was within the maximum pressure limits specified by Rosemount.

(v) The date on which the information of the potential applications problem was obtained.

Amended to March 6, 1980.

(vi) The number and location of all in use at, supplied for, or being supplied for one or more facilities or activities subject to the regulations in this part.

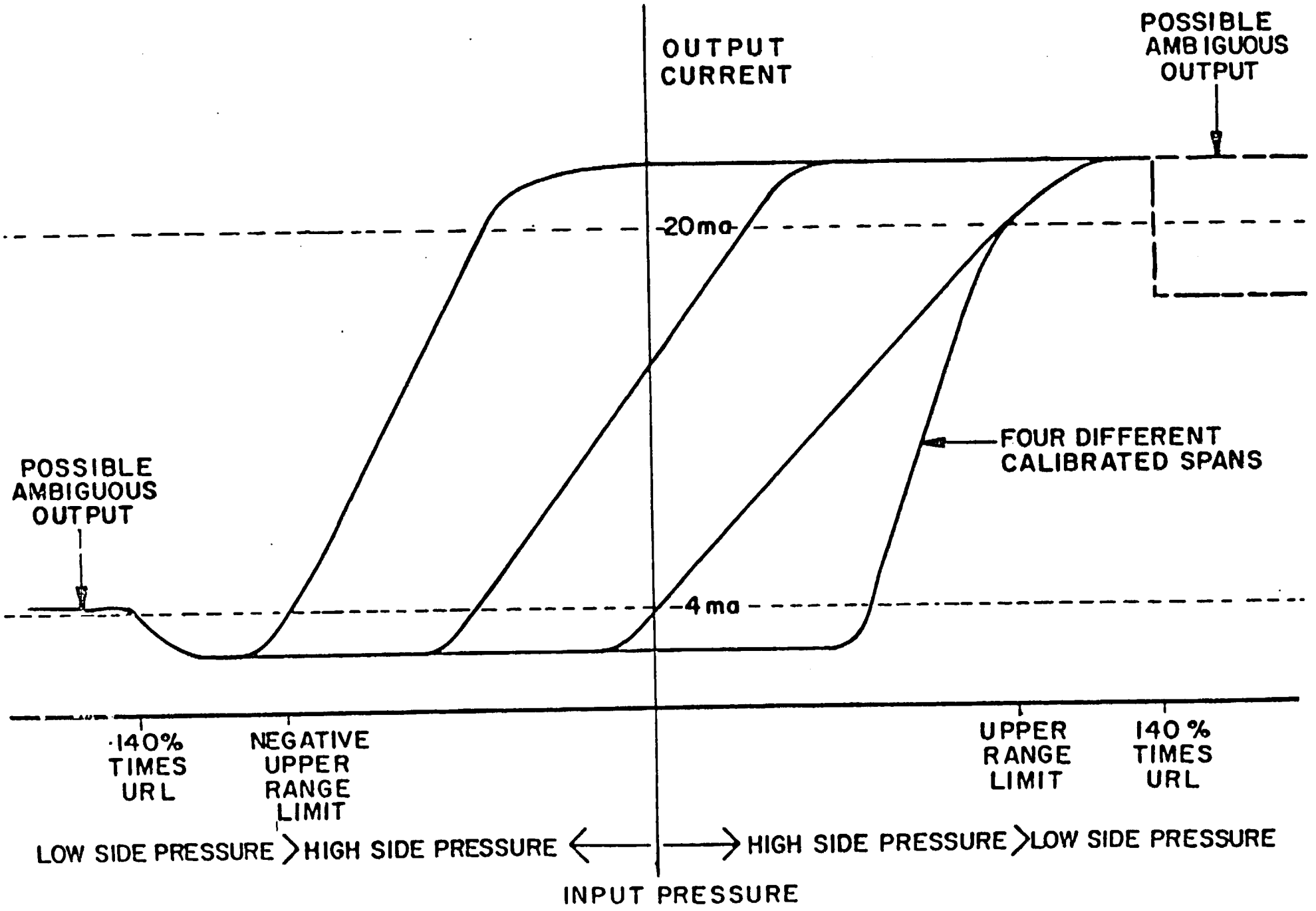
Not applicable.

(vii) The corrective action recommended to negate this potential application problem.

The safety system should be analyzed in view of this supplementary report to determine if a potential application problem exists and appropriate corrections to the safety system should be implemented.

(viii) Any related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given or purchasers or licensees.

Not applicable.


OUTPUT CURRENT
POSSIBLE AMBIGUOUS OUTPUT
20ma
4ma
FOUR DIFFERENT CALIBRATED SPANS
POSSIBLE AMBIGUOUS OUTPUT
-140% TIMES URL
NEGATIVE UPPER RANGE LIMIT
UPPER RANGE LIMIT
140% TIMES URL
LOW SIDE PRESSURE > HIGH SIDE PRESSURE
HIGH SIDE PRESSURE > LOW SIDE PRESSURE
INPUT PRESSURE

Enclosure

RECENTLY ISSUED
IE BULLETINS

Bulletin No.	Subject	Date Issued	Issued To
80-15	Possible Loss Of Hotline With Loss Of Off-Site Power	6/18/80	All nuclear facilities holding OLs
80-14	Degradation of Scram Discharge Volume Capability	6/12/80	All BWR's with an OL
80-13	Cracking In Core Spray Spargers	5/12/80	All BWR's with an OL
80-12	Decay Heat Removal System Operability	5/9/80	Each PWR with an OL
80-11	Masonry Wall Design	5/8/80	All power reactor facilities with an OL, except Trojan
80-10	Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release to Environment	5/6/80	All power reactor facilities with an OL or CP
80-09	Hydramotor Actuator Deficiencies	4/17/80	All power reactor operating facilities and holders of power reactor construction permits
80-08	Examination of Containment Liner Penetration Welds	4/7/80	All power reactors with a CP and/or OL no later than April 7, 1980
80-07	BWR Jet Pump Assembly Failure	4/4/80	All GE BWR-3 and BWR-4 facilities with an OL
79-03A	Longitudinal Weld Defects In ASME SA-312 Type 304 Stainless Steel Pipe	4/4/80	All power reactor facilities with an OL or CP
80-06	Engineered Safety Feature (ESF) Reset Controls	3/13/80	All power reactor facilities with an OL