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NRC REGION II
ATLANTA, GEORGIA

82 SEP 17 P1:50

September 13, 1982

Mr. James P. O'Reilly, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

Re: McGuire Nuclear Station, Unit 1
Docket No. 50-369

Dear Mr. O'Reilly:

Please find attached for your information a report concerning Rotork Model NA-2 electric motor operator switch problems. The problem was identified on June 15, 1982 during the pre-turnover survey on Unit 2, and was reported to the NRC as a generic problem by Rotork on June 23, 1982. This has been previously reported for Unit 2 via 10 CFR 50.55e report SD-370/82-04 which was submitted by Mr. W. O. Parker, Jr.'s letter dated July 23, 1982. The incident was considered to be of no significance with respect to the health and safety of the public.

Very truly yours,

Hal B. Tucker

Hal B. Tucker

PBN:jfw
Attachment

cc: Director
Office of Management and Program Analysis
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Records Center
Institute of Nuclear Power Operations
1820 Water Place
Atlanta, Georgia 30339

Mr. P. R. Bemis
Sr. Resident Inspector-NRC
McGuire Nuclear Station

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DUKE POWER COMPANY
McGUIRE NUCLEAR STATION
INFORMATION REPORT

OCCURRENCE DATE: June 15, 1982

REPORT DATE: September 13, 1982

FACILITY: McGuire Unit 1, Cornelius, NC

IDENTIFICATION: Rotork NA-2 Actuator Control Switch Failures

DESCRIPTION: On June 15, 1982, during the pre-turnover survey (initial setup) on Unit 2, four Rotork Model NA-2 valve actuators were found to have cracked or broken motor control switches. Station personnel contacted Rotork to determine the scope of the problem and the possible solutions. Rotork responded that the cracking problem was limited to the clear plastic switches used on the NA-2 actuators. NA-2 actuators were only used on valves located outside containment. The Unit 1 actuators might contain defective switches as well as the Unit 2 actuators. Rotork indicated that the switches would probably fail at the end of the actuator stroke and the failure would be obvious because the motor would continue to run until the windings overheated and burned open.

Station and Rotork personnel began a survey to determine the number and condition of clear plastic switches on Unit 1 actuators on June 17, 1982. At a meeting on June 21, 1982, Rotork representatives discussed the nature of the problem with Duke personnel and recommended that all clear plastic switches be replaced with the colored plastic switches used on Rotork Model NA-1 actuators. They explained that the defective switches could not be identified by part numbers or the date of manufacture of the actuators. During the outage for eddy current testing of steam generator (S/G) tubes which began on June 24, 1982, all Unit 1 safety related valves containing NA-2 actuators were inspected, and the clear plastic switches were replaced.

Valves that were possibly affected by this incident are located in the following systems: Component Cooling, Diesel Generator Fuel Oil, Residual Heat Removal, Safety Injection, Breathing Air, Instrument Air, Chemical & Volume Control, Auxiliary Feedwater, Nuclear Service Water, Control Area Ventilation, Containment Spray, Refueling Water, Liquid Waste Recycle, Boron Recycle, Nuclear Sampling, Station Air.

Unit 1 operated at 75% power during this incident. The defective switch casings resulted from a manufacturing error. Rotork reported the generic switch problem to the NRC under 10 CFR Part 21 on June 23, 1982.

EVALUATION: The clear plastic cases used on the TK5C/1485, Burgess switches begin to crack at the stress points such as the rivets that hold the two parts of the case together or the screws that assemble the switches into three unit switch banks. Rotork personnel at the June 21, 1982 meeting explained the failure sequence as follows. During the manufacture of the switch casings, the material is cured in a dryer. If the moisture content (humidity) is too high during this process, the water will react with the plastic, reducing its molecular weight. If the molecular weight is low enough, the plastic may be further weakened by its reaction with the gas given off by the wire insulation inside the actuator.

Switches of a similar part number received at the Rotork assembly plant were placed in a common storage area and selected randomly for use in actuators as they were assembled. This random selection has prevented the isolation of defective switches to a particular batch and identifying the actuators on which they were used. A clear plastic switch that is found in the field without cracks may or may not be defective. For this reason all suspect switches were replaced.

Seventy three of the 82 actuators checked had at least one switch bank made up of clear plastic switches. (Each actuator has two switch banks with three switches per bank. One bank reacts to opening torque and open valve position, and the other bank reacts to closing torque and the closed valve position.) Out of the 73 actuators with clear plastic switches, 26 had switches that were cracked (three of these were badly cracked). Valves on which actuators had badly cracked switches included: Refueling Water Storage Tank to Residual Heat Removal Pump Suction; Residual Heat Removal Heat Exchanger Isolation; and Station Air System Containment Isolation.

One of the three switches in each bank is used to stop the actuator at the end of the valve stroke. These switches are actuated by the torque being produced by the motor and can also be actuated by valve position if the switch lever is placed in the limit mode. Normally closed contacts are used in these switches which means that the contacts will be closed when the switch button is not depressed by an actuating lever. The failure mode observed on the Unit 2 switches resulted in the switch contacts remaining closed. Since these contacts must open to stop the valve actuator, a switch failure would result in the actuator continuing to operate, even after the valve has reached the end of its stroke, until the motor windings failed (burned open). A failure of this type would result in a computer alarm indicating that the valve actuator was overloaded. If the valve was being positioned to its non-safety position, it would complete the stroke, fail, and the control operators would be notified via the computer alarm, giving them the opportunity to take corrective action. If the valve was being positioned to its safety position (either by the operators or an automatic signal) the same thing would occur.

The second switch in the bank is used to override the torque switches during the early part of the valve stroke when the valve plug is being removed from its back or front seat. Normally open contacts are used on these switches and the observed failure mode would leave these switches open. Failure of these switches would only affect valve operation if the torque required to move the valve during the early part of the stroke exceeded the respective torque switch setting. The third switch in the bank is used for indication of valve position (a red valve open status light, and a green valve closed status light). Failure of these switches would have no effect on valve operation but the results could be confusing to the operators. The failure of one position indication switch should be obvious to the operators because either one too many or one too few status lights would be illuminated.

None of the switches in the valve actuators mentioned above were broken when they were surveyed. One of more switches in the open side switch bank of the residual heat removal heat exchanger isolation valve broke as technicians were preparing to remove it. Failure of this switch would not have prevented the valve from opening (its safety position). The motor would have been damaged at that point, and any further manipulations would have to be done manually.

SAFETY ANALYSIS: The failure mode of the control switches was such that either the valve actuators would have been able to perform their safety functions, or the motors that had burned out while stroking the valves to the non-safety positions would have caused control operators to receive an overload alarm. Since no valves were found to be inoperable, the health and safety of the public were not affected.

CORRECTIVE ACTION: All of the clear plastic switches on Unit 1 were replaced and all clear plastic switches on Unit 2 will be replaced with Burgess, Model K5C, white plastic switches. Proper valve operation was verified by operability checks and applicable functional tests.