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EF2-61525

50-341

Mr. James G. Keppler, Regional Administrator
Region III
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Subject: Interim Report of 10CFR50.55(e) Item on Limitorque Limit Switch
Rotor Failures (#76)

Dear Mr. Keppler:

This interim report on the Limitorque limit switch rotor failures has been prepared to provide the current status of this problem.

This item was originally reported to Mr. F. Lomax of NRC - Washington D.C. Duty Officer, by Detroit Edison's Mr. D. Ferencz, Acting Supervisor - Construction Quality Assurance, on July 31, 1982.

This item involved cracking and breaking of plastic rotors in Limitorque limit switch assemblies. Three (3) QA Level I valve operators, and several other non QA Level I valve operators, had been found to date. The failures are occurring at the point of attachment, where they are secured by a steel rolled pin.

The type of failure of this plastic component are all similar and appear to be the result of a tension stress buildup at the point where the rotor is fastened to the rotor drive gear assembly. The source of this tension stress can be attributed to two possible causes: Mishandling of the part by untrained personnel, or improper installation of the split pin which holds the limit switch rotor to the mating rotor drive shaft.

In the limit switch assembly, the rotor which is failing is the part which makes and breaks the contacts for the limit switches which in turn, stop the operator when the valve is in its open or closed position depending on the direction of the valve stem travel. The movement of the limit switch rotor is limited to a simple 90° rotation about its axis. External forces which are applied during normal operation are limited to the equally opposing and thus cancelling force applied by the limit switch contacts, the torsional force inputted into the rotor of the split pin connection equal to the drag of the limit switch contacts on the rotor and, the cantilevered weight of the rotor minus the friction force of the contacts acting on the rotor at the split pin connection. All these forces are negligible and could not induce sufficient stress buildup to result in the type of failure being observed.

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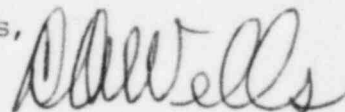
Inspection of the connection of the limit switch rotor to the rotor drive shaft does indicate that a potential for a severe local stress buildup in the rotor does exist if the split pin is improperly installed. The plastic rotors as received by Limitorque have holes molded in them for the split pin. Limitorque procedures for assembly of the rotor to the rotor drive shaft state that the rotor must be reamed out with a #40 drill prior to installing the split pin. This step is necessary for two reasons. First, it aligns the axis of the hole to assure the hole is straight and true, and second, it assures that the hole is the proper diameter to received the split pin. Either a misaligned hole or an undersized hole can result in the compressed split pin imparting a concentrated stress into the rotor at the point of the observed failure. Thus, it is very important both during initial assembly and during rotor replacement that the procedure for reaming the rotor hole be followed.

The tension type of failure being experienced can also be the result of an external force being applied to the assembled rotor. The rotor is attached to its driver shaft such that it becomes a simple cantilever anchored by the split pin. Any external force applied to the shaft will result in a bending moment in the region of the split pin. This bending moment will produce a localized stress in the rotor. Given a large enough external force through careless handling, inexperience or simple accident and the rotor could fail.

A corrective action plan has not been finalized at this time. This information will be included in a future report.

Another report on this item, either interim or final, is scheduled to be sent on or before April 27, 1983. If you have questions concerning this matter, please contact Mr. G.M. Trahey, Assistant Director - Project Quality Assurance.

Very truly yours,



DAW/DF/WRW/pn

cc: Mr. Richard DeYoung, Director
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