



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATING TO COMPATIBILITY OF GREASES IN LIMITORQUE VALVE
OPERATOR LIMIT SWITCHES
INDIANA MICHIGAN POWER COMPANY
D.C. COOK PLANT - UNITS 1 AND 2

1.0 INTRODUCTION

By letter dated April 7, 1988, Region III of the NRC requested NRR to evaluate operability of the Limitorque motor operated valves with mixed greases in their limit switches. Workmen disassembling the operators to be installed in the Unit 2 Auxiliary Feedwater System (AFW) System found a small amount of a grease (Mobilgrease 28) different from the bulk grease (Exxon Beacon 325). The valves were installed in Unit 1 without changing of the original grease provided by the manufacturer. Since all sixteen Limitorque motor operators for Units 1 and 2 were purchased simultaneously, it was suspected that the operators installed in Unit 1 could also contain mixed greases. In Unit 2 all the affected operators will be regreased with Mobilgrease 28 before the unit is restarted. However, Unit 1 is currently operating and the operators could not be regreased without shutting down the unit. The licensee states that Unit 1 can be safely operated until its refueling outage in early 1989. At that time all the affected Limitorque operators will be regreased.

2.0 EVALUATION

The Limitorque limit switches were originally filled by the manufacturer with Exxon's Beacon 325 grease which is an ester - based, lithium soap - gelled product. In the affected operators this grease was mixed with Mobilgrease 28 which is a synthetic hydrocarbon - based, clay - gelled product. According to the criteria developed by EPRI (EPRI NP-4916, Lubrication Guide), these two greases are incompatible, although each of them is individually qualified for use in the Limitorque limit switches. Incompatibility of greases is normally manifested by a change of the physical characteristics of their mixture. Usually it becomes softer, although in some cases hardening may occur with time. It also becomes less resistant to radiation and temperature. Since mixing affects mostly the structure of gelling agents, lubricating properties of mixed greases usually remain unchanged.

A sample of the grease from a Limitorque limit switch in the Cook plant was analyzed for different constituents and from the results it was estimated that the mixture contained about 9 percent of Mobilgrease 28. It is expected, therefore, that some changes of grease characteristics have taken place. Softening of the grease in the limit switch would not cause significant problems, because it is enclosed in a liquid-tight compartment and it is not expected that it would leak out. The valves are situated outside of the containment and during normal plant operation are exposed to relatively mild thermal and radiation environments. The predicted radiation doses would be of the order of 5 mR/hr. Under this condition it is not expected that any

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significant degradation of grease could occur, especially since Beacon 325 is qualified for a radiation environment of 1×10^7 - 2×10^8 R and temperatures of 200-250 deg F and Mobilgrease 28 for 1×10^8 - 5×10^8 R and 200 - 325 deg F. During the postulated accidents in which these valves are required to operate, the highest anticipated radiation dose is below 17R/hr and the highest predicted temperature reached by their surface is 230 deg F. Since the valves will be exposed for a relatively short time to these conditions, it is not expected that the grease will become degraded to the point of affecting their performance. The licensee has consulted Limatorque operator manufacture and two lubrication experts from the industry. None of them foresee any immediate problems. However, they recommended against running the operators with mixed greases for an extended period of time and advise to regrease at the nearest opportunity. The Unit 1 auxiliary feedwater valves have operated this current cycle with possible mixed greases in the limit switch compartment and experienced no operational problems. The information presented above indicates that the Limatorque valve operators in Unit 1 can be safely operated with mixed greases in their limit switches until the next refueling outage.

3.0 CONCLUSION

Based on the above evaluation, the staff concludes that adequate assurances exist that short term operability of the Limatorque valves operator limit switches will not be impaired due to the mixed grease. Therefore, regreasing of the limit switches in the eight Limatorque motor operated valves in the Auxiliary Feedwater System of Unit 1 can be postponed until the next refueling outage scheduled in early 1989.