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

Enclosure

SAFETY EVALUATION OF
PROPOSED MODIFICATIONS TO CVCS
FORT CALHOUN STATION, UNIT NO. 1
DOCKET NO. 50-285

Introduction

Vibrations induced by the operation of positive displacement pumps have been identified as one source that will cause fatigue failures in system piping. On May 17, 1978, NRC requested information concerning pipe cracks in the chemical volume control system due to excessive charging pump vibrations from Omaha Public Power District (OPPD) with respect to the Fort Calhoun Station operating experience. The requested information was provided in letters dated July 11, 1978 and November 6, 1979.

Description and Evaluation

The Fort Calhoun Station utilizes three positive displacement type charging pumps to return the purification flow to the reactor coolant system. The original design included a one-gallon size hydraulic dampener at the discharge side of each of the three pumps. Operating experience indicated that excessive vibrations existed with this design. OPPD has since retained the Southwest Research Institute (SRI) to study and analyze this problem. Field tests made by SRI showed that the one gallon dampener does not reduce the vibrations in the system to an acceptable level, and that conditions were further aggravated by the presence of cavitation on the suction side of the pumps.

An analog model was then developed in conjunction with this study of the initial CVCS design. From the simulation of various design modifications, SRI subsequently recommended several design changes which were accepted by OPPD. The recommendation included: (1) change the discharge side dampeners from one-gallon size to five-gallon size, and (2) add a five-gallon size hydraulic stabilizer to the suction side of each of the three pumps. Simulation showed that system pressure variation will be reduced to $\pm$ 1.35% for a normal discharge pressure of 2100 psig. OPPD has since ordered all recommended equipment and installed it in place except for one stabilizer on the suction side of pump 1-A, which is scheduled to be installed in the mid-January 1980 refueling outage.

Conclusions

OPPD has made a thorough study to resolve the positive displacement pump vibration problem. The design modification, which will reduce the pressure fluctuation to $\pm$ 1.35% for 2100 psig discharge pressure, is acceptable. The modification has been completed with the exception of the installation of one stabilizer which is scheduled for the mid-January 1980 refueling outage. We have determined that the proposed modifications will adequately reduce the probability of charging pump vibrations causing fatigue failure in the CVCS.

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