

ENCLOSURE

CONNECTICUT YANKEE ATOMIC POWER COMPANY

CHARGING PUMP VIBRATIONS

SAFETY EVALUATION

INTRODUCTION

Vibrations induced by the operation of positive displacement pumps have been identified as one source that will cause fatigue failures in chemical volume control system piping. On May 25, 1978 NRC requested information of pipe cracks in CVCS due to excessive charging pump vibrations from Connecticut Yankee Atomic Power Company with respect to the Haddam Neck plant operating experience. The requested information was provided in letters dated July 26, 1978, October 17, 1979 and April 23, 1980.

Description and Evaluation

Haddam Neck plant employs two centrifugal pumps for its chemical volume control and charging systems. Both pumps have a maximum capacity of 360 gpm under the normal operating pressure of 2300 psig. There is also one positive displacement metering pump in the system. This pump has a capacity of 35 gpm and has been used only sparsely during the years at the rate of less than 14 hours annually, mostly for hydrostatic testing purposes. The available NPSH for this pump is about 79 feet while the required NPSH is 17 feet.

On December 1, 1978, a test was conducted to evaluate the performance of the pump under adverse operating conditions. During the test, the "A" centrifugal charging pump was operated at 120 gpm and the metering pump was operated at 22 gpm, both under the normal operating pressure. The volume control tank pressure was then lowered to reduce the available NPSH for the metering pump. No excessive vibration or noise was observed during the entire test on pumps and their adjacent piping.

CONCLUSION

The test conducted by the Haddam Neck plant indicated that large amplitude vibration does not exist in the system. Assuming that small amplitude, high frequency flow induced vibration exists at 60 Hz, 10 years of operation of this pump would accumulate to  $30 \times 10^6$  cycles at 14 hours per year. If fatigue failure did not show after these many cycles, it is likely that the operational life will not be effected by fatigue considerations. We do not anticipate fatigue failures in the system piping by the operation of this metering pump.