

SAFETY EVALUATION REPORT
DESIGN OF DIESEL GENERATOR LUBRICATION
MODIFICATIONS FOR DIESEL GENERATORS 1C AND 2C
FARLEY UNIT 2
DOCKET 50-364

I. INTRODUCTION

The licensee, Alabama Power, in its letter dated September 21, 1981 has proposed certain modifications to Diesel Generators (DG) 1C and 2C at the Farley Unit 2 plant to incorporate the final design of the modification of the lubrication system for the Fairbanks-Morse opposed-piston diesel generators which was identified as Condition 2.C.(19)(c) to Facility Operating License No. NPF-8. The present DG unit was provided with two systems to precondition the engine lube oil (LO) system. The one referred to as the keepwarm system, consisted of a motor driven pump and a heater through which a small flow of lube oil was run while the engine was not in operation. The oil was pumped from the L.O. sump, thru the heater and back into the opposite end of the sump. The heater was thermostatically controlled in an attempt to maintain the L.O. sump at a moderate temperature. This system did not lubricate the engine wearing parts when the engine was on standby. The other system consisted of a somewhat larger capacity pump which was used immediately prior to operating the engine to fill the system with lube oil in preparation for an engine start. This arrangement was used whenever the engine was started for testing or maintenance operations. In the event of a need for emergency service, startup was made without prelubing the engine. Dry starting of these diesel generators results in momentary lack of lubrication of various moving parts which could eventually lead to failure.

II. EVALUATION

The licensee's proposed design modification will provide lubricating oil to the lower crankline bearings when the engine is shut down and a sufficient volume of oil to the upper crankline bearings coincident with engine startup. The proposed method will provide prelube of the engine for all startups including emergency starts. The lower bearings will be lubricated by the existing keepwarm lube oil pump. The upper bearings will be supplied oil from a two gallon accumulator which is pressurized by engine starting air thereby producing an instantaneous discharge of oil to the upper crankline bearings coincident with engine starting.

The engine manufacturer conducted field tests that demonstrated the feasibility of providing oil flow to the lower crankline without filling the upper crankline. The test work demonstrated that with a properly sized lube oil circulating pump and with the oil at the proper temperature an oil level could be maintained above the lower crankline, but below the level of the upper crankline. During these tests it was discovered that the upper crankline required 6 to 10 minutes for oil drainback prior to start of lube oil circulation after engine shutdown.

In summary, the keepwarm lube oil circulating system was modified by increasing the oil heater capacity from 6 to 15 kw and rearranging the piping so that the discharge from the heater entered the engine oil system through a check valve on the discharge side of the engine driven lube oil pump. The major electrical changes consisted of replacing the wiring from #12 to #8 AWG, increasing the circuit breaker units from 20 amp to 50 amp, and adding a time delay relay to the circuit. Modifications to the interior of the engine consists of rerouting the oil supply to the upper lube oil header such that the heater will not readily drain and adding a lube oil accumulator to the upper crankline oil system. The accumulator fills with oil during normal engine operation. The next time the engine is started, the lube oil accumulated in the cylinder is forced by starting air pressure into the bearings along the upper crankline, thus filling the bearings with oil as the engine begins to rotate in starting.

III. CONCLUSION

Based on our review of the licensee's submittal we conclude that the modification to the lubrication system in DG 1C and 2C satisfies the requirements of adequate lubrication supply to all bearings preventing a dry start under automatic starting. Further, we conclude that the modified lubrication system conforms to the recommendations in NUREG/CR-0660 and therefore, Licensing Condition 2.C.(19)(c) has been satisfied.

Date: OCT 29 1982

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