



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

Docket File

March 27, 1992

Docket No. 50-348 and 50-364

MEMORANDUM FOR: Elinor G. Adensam
Project Directorate II-1
Division of Reactor Projects - I/II

FROM: Stephen T. Hoffman, Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II

SUBJECT: TRIP REPORT ON VISIT TO JOSEPH M. FARLEY NUCLEAR
PLANT, UNITS 1 AND 2

On September 4 and 5, 1991, Gus Lainas, Assistant Director for Region II, Elinor Adensam, Project Director, and Steve Hoffman, Project Manager, visited Joseph M. Farley Nuclear Plant, Units 1 and 2 (Farley). The purpose of the visit was to tour the site and meet with Alabama Power Company (APCO) personnel.

On September 5, 1991, the following people met to discuss the operation and maintenance of the Farley diesel generators (DGs).

NRC

APCO

Gus Lainas
Elinor Adensam
Steve Hoffman
Mike Morgan

Dave Morey
Mike Stinson
Richard Hill
Rex Yance
Wayne VanLandingham
Jim Hunter
Harold Garland

APCO provided an overview of the electrical system design concerning the DGs as well as a discussion of their approach to operating and maintaining the DGs.

Reliability

DG reliability was discussed and the following data were provided for the last 100 starts:

Average:	Large DGs - 96%
	Small DGs - 100%
By Individual DG:	1-2A - 98%
	1B - 97%
	2B - 98%
	1C/2C - 100%

Station Blackout Target Reliability - 95%

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Availability

The following data concerning DG unavailability were provided for the last 6 quarters ending with the second quarter of 1991:

DG 1-2A	111 hours average/quarter
1B	118
2B	83
1C	101
2C	<u>68</u>
	96 hours average/quarter

Materials provided by APCO at the meeting are contained in the Enclosure.

Original signed by:
Stephen T. Hoffman, Project Manager
Project Directorate II-1
Division of Reactor Projects - I/II

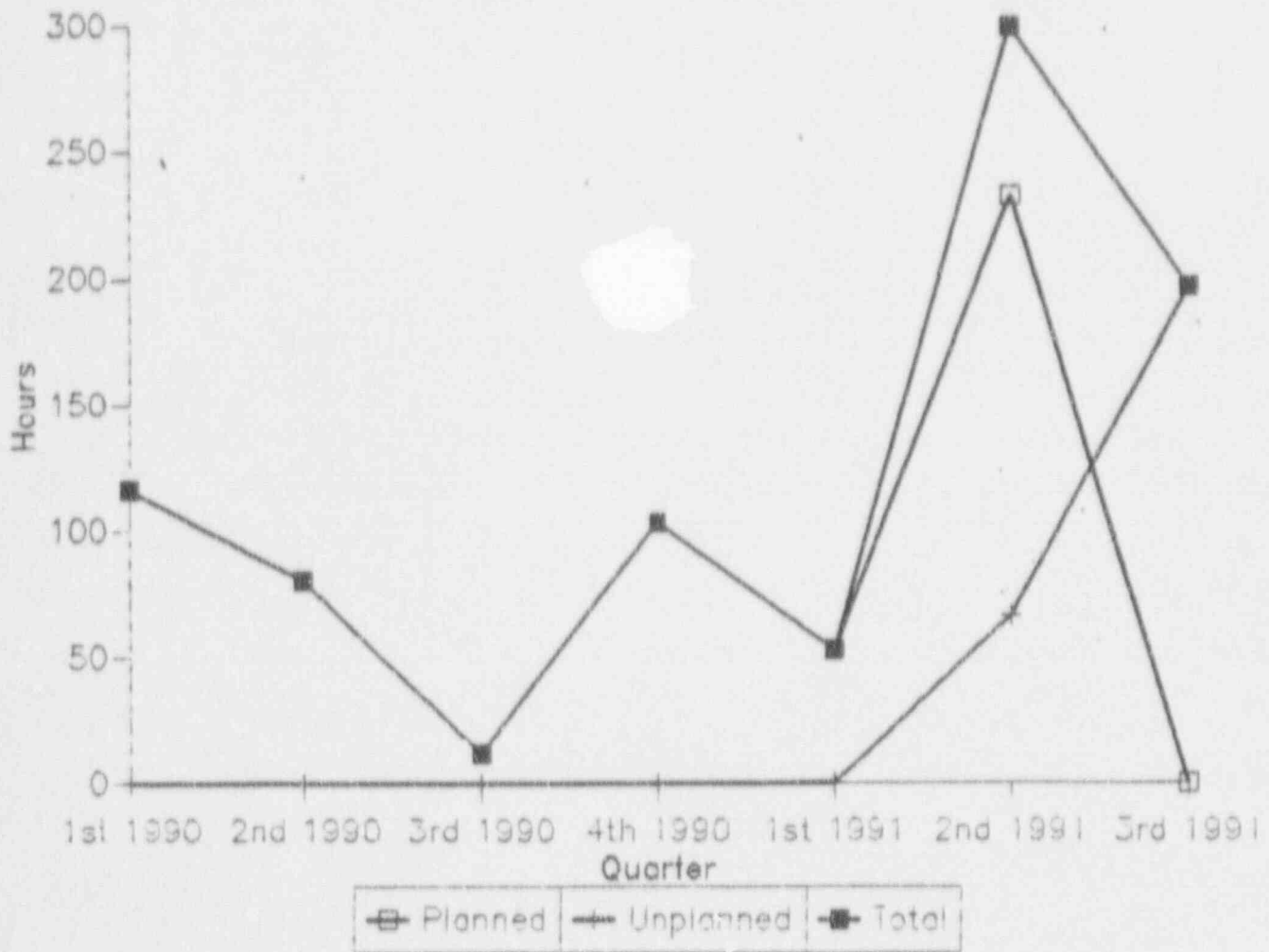
Enclosure:
As stated

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E. Adensam
S. Hoffman
P. Anderson

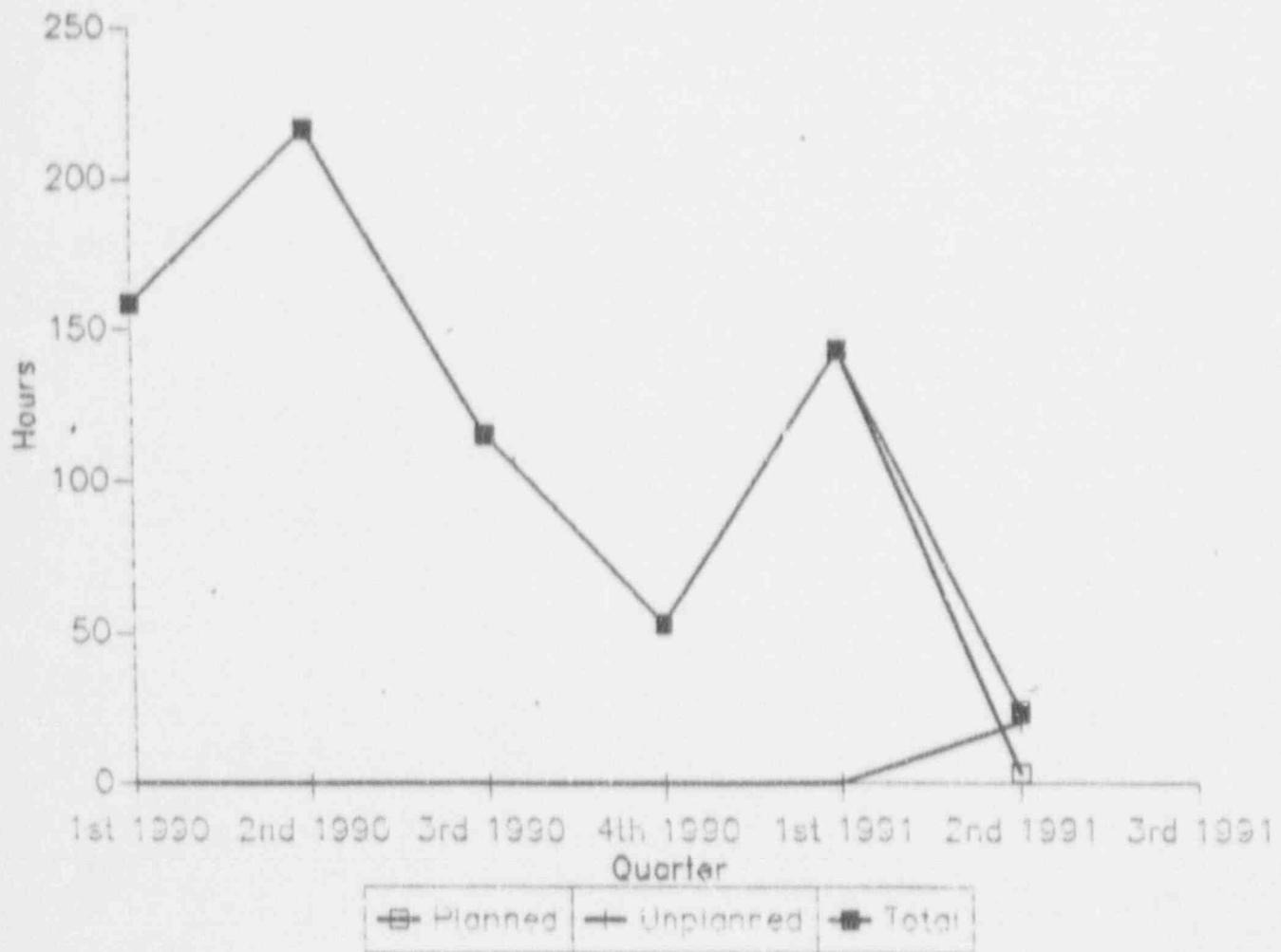
PM: *STH*
S.Hoffman, dt
3/24/92

E. W. Adams
DRPE
EAdensam
3/24/92

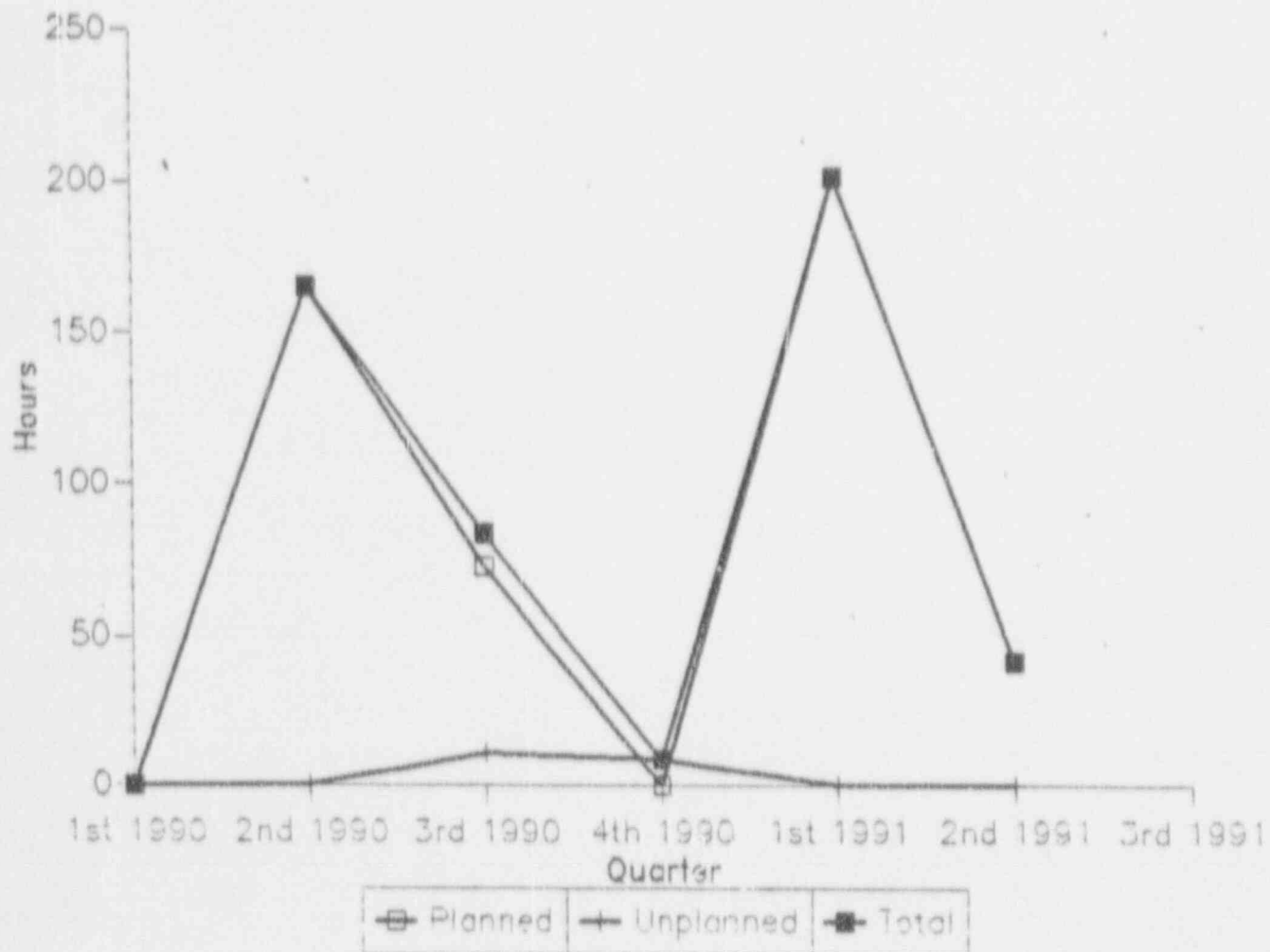
1-2A Unavailable Hours



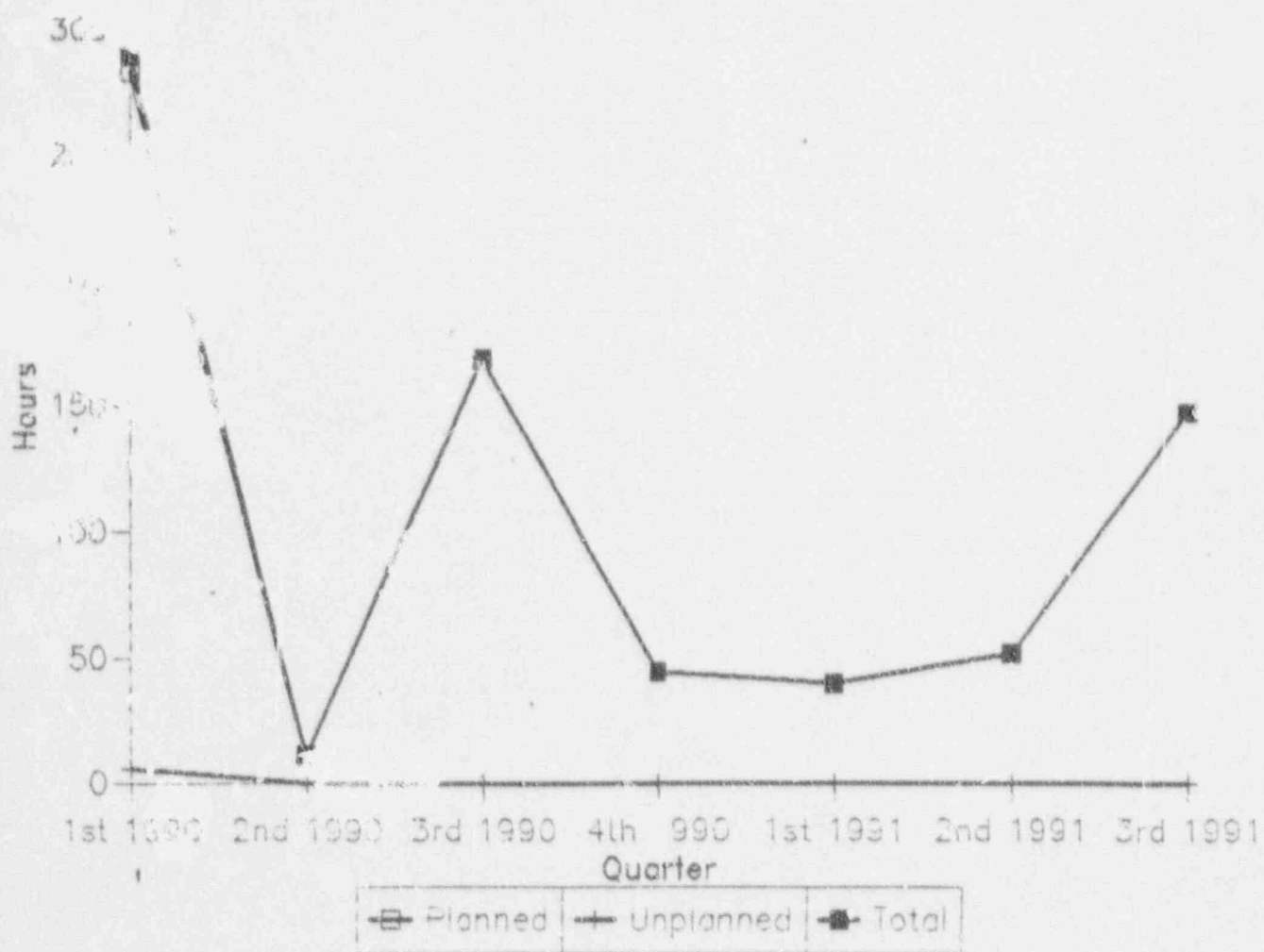
1B Unavailable Hours



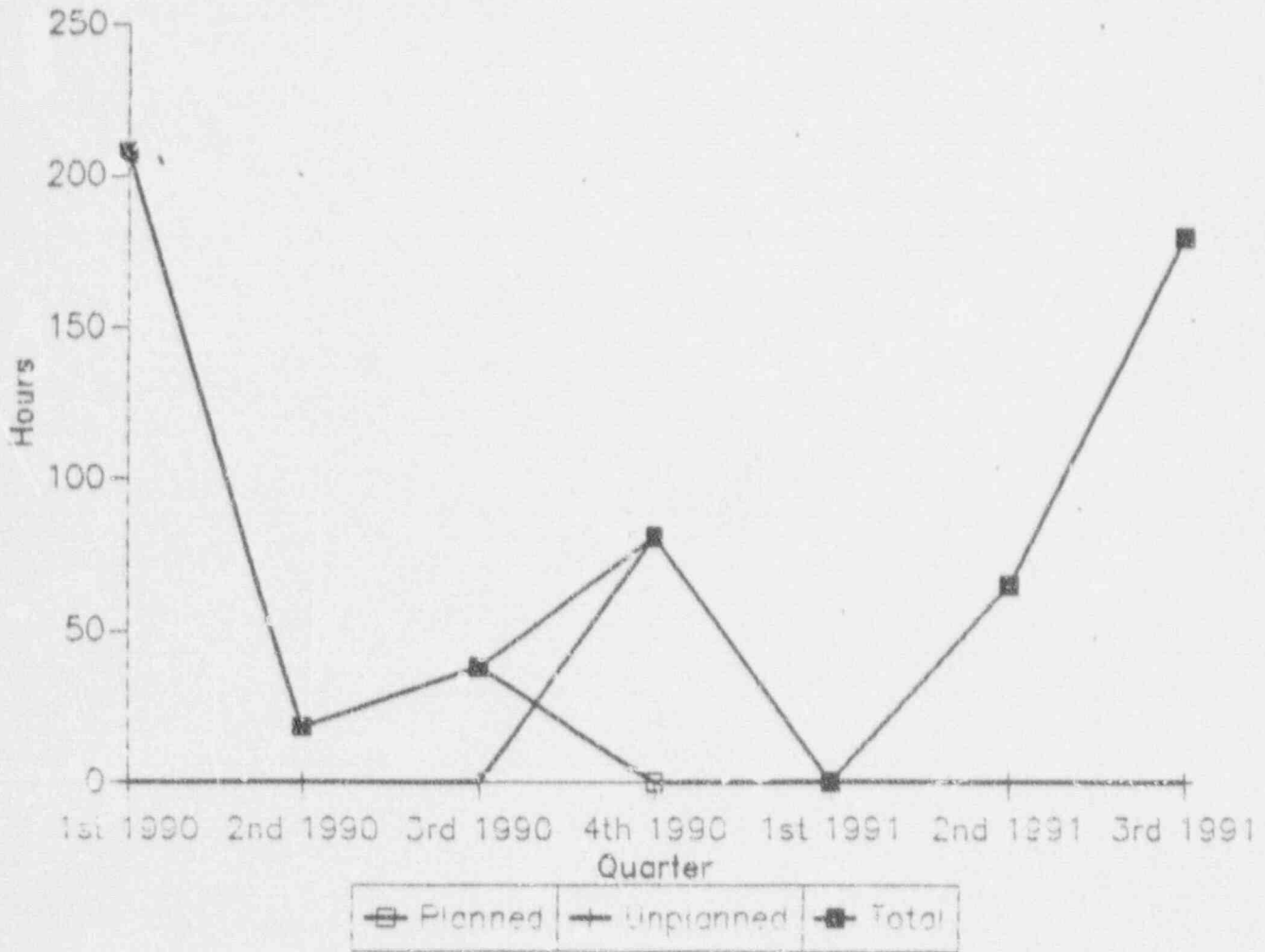
2B Unavailable Hours



1C Unavailable Hours



2C Unavailable Hours



PC-2V EMERGENCY DIESEL ENGINE MAINTENANCE PROGRAM (1-2A,1B,2B)

I. Preventive Maintenance Program Based On Recommendations From Coltec Industries, Our Experience and Industry Experience

NOTE: A technical representative is brought on site for 3-year and 18-month inspections. The Tech. Rep monitors the diesels during runs and assists with maintenance.

A. 3-Year Inspection (MP-14.4)

- MP-14.1 (18-month inspection)
- Check gear train backlash and flexible drive locks
- Check fuel control linkage fasteners
- Inspect exhaust valve cage assemblies

B. 18-Month Inspection (MP-14.1)

- Replace governor oil
- Perform jacketwater leak test/Intercooler water leak test
- Inspect externals and internals for leaks, foreign material, locking devices, and tubing integrity
- Check drive train, camshafts, bearings, cams, push rods, etc. for uneven wear, nicks, burrs, scratches
- Check valves for freedom of movement
- Test injectors
- Check main bearing jackscrews and cross-bolts and exhaust bolting for tightness
- Inspect turbo chargers for deposits and anti-corrosion plugs condition

B. 18-Month Inspection (MP-14.1) (con't)

- Remove, clean, and inspect main air start and pilot valve assemblies, cylinder air start valves, and air start distributors
- Check tightness of all foundation bolts and piping
- Measure crankshaft web deflections and bearing clearances
- Check connecting rod bearings
- Inspect cylinder and liners
- Inspect and clean overspeed trip mechanism
- Check engine cooling system heat exchangers and check valves for scale and debris
- Replace fuel and lube oil filters
- Inspect day tank and foot valve and fuel oil storage tank Y-strainers
- Inspect fuel rack for freedom of movement and travel
- Visually inspect tubing for wear and deterioration
- MP-14.8 (run-in procedure) is performed as required
- Maintenance run performed
 - Check governor for proper operations
 - Record cylinder firing pressures and temperatures

C. Additional 18-Month Inspections

- Inspect and clean alternator
- Check generator bearing insulation resistance
- Perform diesel start circuitry test
- Calibrate all maintained instruments

D. 3-Month Inspection (MP-14.6)

- Check lube oil filter differential
- Check pump seals for excessive leakage
- Remove rocker covers and check for proper lubrication, evidence of water leaks and valve lift clearances
- Check fuel racks for freedom of movement and rack stop for security and position
- Check fuel oil system for check valve function
- Check hoses and hose clamps for deterioration and looseness
- Remove, clean, and inspect main air start and pilot valves
- Monitor engine during run for leakage

E. 6-Month Vibration Check

- Vibration data collected from predetermined locations and analyzed

F. 2-Week Inspection (during normal surveillance run)

- Inspect diesel engine for leakage, tighten components when possible and write MWRs to have repairs performed as necessary.

G. Lubrication tasks are performed by each group according to task schedule

- Samples of lube oil taken and analyzed every 3 months

H. Information Notices

- All information notices received are reviewed and appropriate actions taken, when applicable.

II. Design Changes (Proposed and Actual)

A. Enhancement

- On-ship duplex lube oil strainers installed
- Engine service water valve position on main control board installed
- Physical protection for engine instrumentation installed
- Engine water pumps vent to header implemented
- Strainer storage installed
- Spool pieces installed to allow UT measurement of service water flow
- Fuel header vent back to day tank installed
- Air dryers installed
- Reflash capability on annunciator panels implemented
- Total replacement of air-start system with refrigerant or heater system proposed
- Installation of engine monitoring system proposed

B. Corrective

- Air compressor discharge check valves upgraded for higher operating temperature
- Air dryer before cooler installation proposed to drop inlet air temperature
- O-ring removed from Robertshaw 3-way valves poppet assemblies
- Lower overrun assemblies replaced in Robertshaw 3-way valves

III Corrective Maintenance

- Engine deficiencies are evaluated and worked on an available-for-work basis and prioritized according to severity
- Slow-start maintenance is performed on any diesel with start time greater than 10 seconds (12 seconds is the technical specification limit).

IV Anticipatory Maintenance

- Diesel run logs are trended and reviewed for anticipation of problems - MWRs written to investigate.
- Trends include:
 - Engine coolant temperature and pressure
 - Engine lube oil temperature and pressure
 - Exhaust temperatures
 - Crankcase vacuum
 - Raw water pressure
 - Start times

V Current Problems

A. Air start system contamination

- Carbon steel piping cleaning and conditioning currently scheduled for mid-September as an interim solution

B. Spare parts availability

- Due to a change in the FNP QC program, a large number of diesel spare parts purchased commercial grade cannot be used in maintenance repair activities unless approved by QC. This process is slow at best and therefore increases the unavailability of the diesels. Currently Colt is reviewing the list of parts that fail to meet the new higher standards.

C. Diesel load swings

- The problem is being evaluated and the 2B diesel will be monitored during its next run to facilitate that evaluation.

D. Robertshaw 3-way valves load springs

- PCR pending to replace the load springs on all inverted valve applications, as required.

I. Preventive Maintenance Program Based On Recommendations From Coltec Industries, Our Experience and Industry Experience

NOTE: A technical representative is brought on site for 5-year and 18-month inspections. The Tech. Rep monitors the diesels during runs and assists with maintenance.

A. 5-Year Inspection (MP-13.8)

- MP-13.1 (18-month inspection)
- Clean turbocharger impeller and diffuser, if needed
- Remove and inspect the #13 and #14 lower main bearings
- Check remaining main bearing clearances
- Clean/replace air filter elements, as required
- Disassemble, clean and inspect air start valves
- Check torsional damper bushings and pins for wear
- If visual inspection indicates, then remove, disassemble, and inspect a lower piston assembly and liner

B. 18-Month Inspection (MP-13.1)

- Replace governor oil
- Inspect externals and internals for leaks, foreign material, locking devices, and tubing integrity
- Jacketwater/intercooler water leak test
- Inspect vertical drive coupling bearing
- Inspect the governor for oil leaks
- Inspect air start distributor tubing for cracks and leaks
- Inspect pump drives
- Inspect blower impellers

B. 18-Month Inspection (MP-13.1) (con't)

- Remove and test injector nozzles
- Check fuel injection timing and timing components
- Clean exhaust ports
- Inspect piston rings, pistons, and cylinder liners
- Check lower crank strain, crank lead, end float and all bearings for shift
- Check wrist pin bushings clearances
- Check cam shaft bearings, cams, roller faces, and torsional dampers
- Clean crankcase vacuum ejector assembly and replace all rubber hoses and inspect hose clamps
- Check engine heat exchangers for scale and debris
- Check generator hold-down bolts for tightness
- Inspect lube oil pump and water pump drives and blower gears
- Clean air line Y-strainers
- Check engine foundation bolts for tightness
- Clean Y-strainer to keep warm pump and prelube pump
- Inspect day tank and foot valve
- Clean fuel oil storage tank Y-strainer
- Perform check out of air start distribution system
- Inspect tubing for wear and deterioration
- Replace lube oil and fuel oil filter cartridges
- Perform MP-13.10 (engine run-in) if major engine components replaced
- Maintenance run
 - Check governor for proper operations
 - Record cylinder firing pressures and temperatures

C. Additional 18-Month Inspections

- Check generator bearing insulation resistance
- Perform diesel start circuitry test
- Inspect and clean alternator
- Calibrate all maintained instruments

D. 3-Month Inspection (MP-13.7)

- Check lube oil filter differential
- Check fuel racks for freedom of movement
- Check pump seals for excessive leakage
- Check all flexible hoses and hose clamps
- Check main bearing booster servo/oil accumulator, booster servo and external air piping for leakage

E. 6-Month Vibration Check

- Vibration data collected from predetermined locations and analyzed

F. 2-Week Inspection (during normal surveillance run)

- Inspect diesel engine for leakage, tighten loose components and write MWRs to correct deficiencies

G. Lubrication tasks are performed by each group according to task schedule

- Samples of lube oil taken and analyzed every 3 months

H. Information Notices

- All information notices received are reviewed and appropriate actions taken, when applicable.

II. Design Changes (Proposed and Actual)

A. Enhancement

- Continuous lubrication system installed
- Strainer storage installed
- Spool pieces installed to allow UT measurement of service water flow
- Air dryers installed
- Physical protection for engine instrumentation installed
- Reflash capability on annunciator panels implemented
- Total replacement of air start system with refrigerant or heater system proposed
- Installation of engine monitoring system proposed

B. Corrective

- Air compressor discharge check valves upgraded for higher operating temperature
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C. Diesel load swings

- The problem is being evaluated.

D.G. AIR START
SYSTEM IMPROVEMENT



Subject: PC2 Emergency Diesel Generator
Air Start Pilot Valve Failures
To: Mr. D. N. Morey

Date: July 16, 1991
From: J. E. Garlington, General Manager
At: Nuclear Support

Parley Staff has reported problems with the air start pilot valves on the PC2 Emergency Diesels (1B, 2B, 1-2A). The problem involves foreign matter, identified as rust particles from the starting air supply, entering the piston-valve body. Accumulation of these particles can cause the pilot valve to fail in the open position resulting in a complete discharge of air from the receiver.

Production Change Request, PCR 91-1-7576, was approved to install an air filter upstream of the air start pilot valve. In support of the PCR, Nuclear Support requested Coltec Industries' approval of the design change. Coltec Industries verbally approved the installation of a Balston air filter (Coltec Part Number P12616577); however, they requested additional proposed design and installation information prior to their written approval. SCS is working with onsite personnel (PHD) in developing the design details for the filter installation.

Although Coltec Industries has no objection to installing a filter, they consider it a "Band-Aid" approach unless the rust is eliminated from the air start system. Coltec Industries has experienced rust in another emergency diesel application. South Carolina Electric and Gas Company (SCE&G) contracted Halliburton Industrial Services through Coltec Industries to chemically remove the rust. To date, SCE&G has experienced no further problems with rust in the air start system. The only difference between the FNP and SCE&G air start skids is the method of drying air leaving the compressor. SCE&G uses an electric heater to remove moisture. Nuclear Support concurs with Coltec Industries and recommends that a meeting be scheduled at FNP to develop an action plan to clean the air start systems. Nuclear Support will arrange for a representative of Halliburton Industrial Services to attend the meeting upon FNP concurrence.

It should be noted that NS is also working with Coltec Industries to provide a proposal for installing an entirely new stainless steel air start system. FNP will be kept apprised of the progress made in this area.

J. E. Garlington
J. E. Garlington

JEG/DEM/DSM/drp:DK12-35

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