UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA ST., N.W., SUITE 3100
ATLANTA, GEORGIA 30303

Report No. 50-348/80-28

Docket No. 50-348

License No. NPF-2

Licensee: Alabama Power Company
P. O. Box 2641
Birmingham, AL 35291

Facility Name: Farley Nuclear Plant Unit 1

Inspection at: Farley Plant near Dothan, Alabama

Inspection Conducted: September 16-19, 1980

Inspector: L. E. Foster — Nov. 14, 1980
L. E. Foster, Inspection Specialist, PAB — Date Signed

Approved by: W. D. Shafer for — Nov. 14, 1980
W. D. Shafer, Acting Chief, — Date Signed
Performance Appraisal Branch

Inspection Summary

Inspection on September 16-19, 1980, (Report No. 50-348/80-28)
Areas Inspected: Special, announced Performance Appraisal Inspection of the licensee's program and documentation associated with the control of centrifugal Charging/Safety Injection Pumps manufactured by Pacific Pump Division of Dresser Industries. This inspection involved 25 inspector-hours onsite by one Performance Appraisal Branch inspector.

Results: Of the areas inspected, no items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

Licensee Employees

*W. G. Hairston, Plant Manager
*J. D. Woodard, Assistant Plant Manager
D. Morey, Operations Supervisor
H. M. McClellan, Generating Plant Engineer
*W. D. Shipman, Maintenance Superintendent
*D. E. Mansfield, Unit No. 2, Startup Superintendent
*W. C. Carr, Quality Assurance Engineer
*J. W. Kale, Quality Assurance Engineer
T. Hardy, System Analyst Engineer
H. Garland, Maintenance Supervisor

The inspector also interviewed several other licensee employees, including administrative staff personnel.

Other Organizations

R. Bavlig, Westinghouse Site Representative

NRC Resident Inspectors

W. H. Bradford, Senior Resident Inspector
*J. P. Mulkey, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on September 19, 1980, with those persons indicated in Paragraph 1 above. The licensee was informed that no items of noncompliance or deviations were identified.

3. Licensee Action on Previous Inspection Findings

The inspector did not review previous items of noncompliance or unresolved items.

4. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance, or deviations. An unresolved item disclosed during this inspection is discussed in Paragraph 13.

5. General

The Performance Appraisal Branch conducted an indepth review of the licensee's program and performance associated with control of the charging and safety injection pumps. The pumps selected for this series of performance appraisal inspections were the centrifugal pumps manufactured by Pacific Pumps Division of Dresser Industries. These pumps are used on several safety related systems such as the Charging, Safety Injection, and Auxiliary Feedwater Systems. The Farley facility utilizes these pumps in the Charging and Safety Injection Systems.

The selection of centrifugal pumps was based on problems encountered with centrifugal pumps as described in NRC Information Notice No. 80-07, dated February 29, 1980, and failure rates reported in the "Nuclear Plant Reliability Data System Report" (NPRD). Subsequent to IE Notice 80-07, cracks in the stainless steel cladding of two Pacific Pumps have occurred at the Zion and Beaver Valley Plants.

6. Objective and Scope

The objectives of this inspection were to verify that the component had been designed, fabricated, installed, tested, operated, modified, and maintained as required by applicable specifications and procedures; to verify that the licensee/vendor has, and is implementing, controls to ensure that the component fulfills its design objectives and functions; and to determine the effectiveness of the licensee's program associated with these components.

The scope of the inspection included a review of purchase orders, specifications, drawings, vendor inspection reports, test results, procedures, modification packages, and maintenance records associated with Pacific Pumps, Serial Nos. 46354, 46355, and 46356. Interviews with licensee personnel were also held.

7. Documents Reviewed

(a) FSAR Section 6.3, "Emergency Core Cooling System"

(b) Farley Technical Specification, Section 3/4.5

(c) Farley Organization Chart

(d) Operations QA Manual, Chapter 10

(e) Purchase Order No. 546-CAZ-103311BN

(f) Quality Assurance Procedure OQAD-WP-30 "Procurement"

(g) Selected Quality Control Procedures

(h) Westinghouse (W) Equipment Specification (E. Specs) No. 677125 and other W Specifications related to cleanliness, packing, shipping and testing

(i) Administrative Procedure No. 24 and Operating QA Procedure WP-18 "Test Control"

(j) Pump Assembly, Foundation, and Installation Drawings

(k) Pump Performance Test Data Curve Nos. 555910 and 555911

(l) Farley Procedures OQA-WP-15, FNP-1-MP-5.4, FNP-Q-GMP-21, and FNP-O-AP-14

(m) Selected Work Requests concerning work on charging pumps

(n) W Quality Release Form Nos. 06899, 06900, 06901, 10612, 10610, 10607, and 26564

(o) Various correspondence between NRC (NRR), Westinghouse, Pacific Pump, and the Licensee concerning pump problems and corrective action

(p) Pump Installation and Alignment Data Sheets

(q) W letter Nos. NS-CE-1536 dated 9/1/77 to NRC "Report of Safeguard Pump Shaft Failures" and NS-TMA-2245 dated May 8, 1980 "Safety Injection Termination"

(r) Vendor Instruction Manuals

(s) Design Change Package 80-679 and Safety Evaluation for this change notice

(t) Various Receipt Inspection, Equipment Release, and Nonconformance Reports

(u) FNP Memorandum dated July 21, 1980 concerning IE Information Notice 80-07

(v) Audit Report Nos. 80/10, and 80/13

8. Purchase Order, Contract and Specifications

The Charging and Safety Injection Pumps for Farley Unit 1 were purchased from Pacific Pumps by Westinghouse (W), the licensee's NSSS supplier. W also purchased pumps for other licensees under the same contracts and purchase orders. The High Head SI/Charging system at Farley contains three centrifugal motor driven pumps. W prepared the equipment specifications (677125 and 676428), supplied vendor inspection, witnessed tests, and performed final acceptance inspections at the vendor's facility. W QA Specifications were also a part of the purchase order requirements. Requirements in the contracts and purchase orders specified that the pumps be fabricated and tested to W specifications and be inspected per the November 1968 ASME Draft Code for Pumps and Valves. Material specifications, testing requirements, QA/QC requirements, and other requirements were specified in other W specifications. Farley Nuclear Plant (FNP) had several additional

purchase orders with Pacific Pumps for spare parts and repair of pumps. The licensee had contracted Southern Company Services, Inc. (SSI) and Bechtel to review the design, design changes, and procurement documents.

The detailed inspection records for individual pump parts and assemblies were not available for review; therefore, the inspector could not confirm whether the individual parts and assemblies were fabricated and assembled as required by detailed drawings. The vendor and W have changed the original heat treating procedure on the shafts to help alleviate shaft failures. The pumps at the Farley facility have the new heat treated shafts.

Based on examination of purchase orders, specifications, and other related documents, (material certs, quality release forms, and performance curves) it appeared that the technical and QA requirements were adequately specified and met.

9. Surveillance and Audits

The licensee stated that the pump vendor surveillances and audits were primarily performed by Westinghouse (W), Southern Company Services, Inc. (SSI) and Bechtel. It was noted that W purchased the same Charging/SI Pumps for several plants and performed the primary vendor surveillances and audits. The licensee stated that SSI and their Corporate Office also performed audits and surveillances on W and Pacific Pumps. The licensee's Corporate Office also audited SSI as required by Procedure OQA-WP-23.

The inspector examined pump performance curves, vendor test results, W quality release forms, test witness forms, W certifications, and correspondence between the licensee, W, SSI, and the vendor. These appeared to confirm that surveillances and audits were performed.

Surveillance and audits of site activities associated with the charging and safety injection pumps were performed by the site QA group and Bechtel. Site audits and surveillances were performed on storage of pumps and parts; instrument calibration; procedure implementation; qualification of personnel; QC activities; work requests; disassembly; assembly; modifications; and inservice testing of pumps. Based on the review of the above documentation and interviews, it appeared that adequate site audits and surveillances were performed on pump activities.

10. Receipt Inspection, Storage and Handling

Receipt inspection of pumps and replacement parts was controlled and performed by procedures. The inspector examined several receipt inspection reports for pumps and spare parts. The inspection packages included W release forms, hold tags, nonconformance reports, evaluations, corrective actions and final acceptance reports. These records were on microfilm in the document control center. Audits and surveillance of these activities had been performed by the licensee.

The licensee had issued nonconformance reports which identified shipment damage, loose set screws, bent shafts, and lack of complete documentation. Receipt inspection of replacement shaft for "B" pump showed that the shaft was bowed. The licensee attempted to straighten the shaft by heating; however, the straightening was unacceptable and the shaft was scrapped. A replacement shaft was also found bowed and was returned to the vendor.

Review of receipt inspection reports associated with pumps, accessories, and replacement parts showed that inspections were performed, discrepancies were identified, and corrective actions were implemented. Material issue forms were used to withdraw pumps and parts from the store room. The licensee informed the inspector that Pacific Pump was redesigning the shipping container used to ship pump internals.

11. Installation, Testing, Acceptance and Operation

Documentation associated with the installation, testing, and operation of the Charging and Safety Injection Pumps was examined. FNP procedures and drawings were utilized along with the vendor's technical manuals. The manuals, procedures, and drawings had been revised to incorporate changes. Installation inspections were performed utilizing applicable check sheets to ensure that the pumps and accessories were installed and aligned properly. Mechanical and electrical prerequisite requirements were verified and preoperational testing was performed as specified by procedures. Startup data sheets included acceptance criteria such as speed, vibration, motor current, suction head, temperature, discharge head, flow and lube oil pressure. During these tests, maintenance personnel observed pump operation in order to have first hand knowledge of any problems encountered during the testing. Administrative Procedure 24 and OQAD-WP-18 "Test Control" were the controlling documents used during testing.

Operating and surveillance test data were reviewed and found satisfactory. The surveillance tests were performed monthly by qualified personnel and were conducted per procedures FNP-1-STP-4.1, 4.2 and 4.3. Acceptance criteria were specified and the test data forms included instruments used, test results, and acceptance signatures. Problems encountered were reported and work requests were issued to the maintenance department. The maintenance department then evaluated the problems and performed corrective action. The licensee had committed to perform "Inservice Testing of Pumps" (IST) as required by ASME Section XI, 1972 Edition.

Review of records showed that IST's were performed and evaluated. Trend analyses were being performed by the Performance Evaluation Group to determine if adverse trends in pump parameters were developing.

Several Licensee Event Reports (LER's) associated with pump problems had been transmitted to the NRC. These LER's included broken shafts, seized rotors, oil cooler problems, and personnel errors. These LER's appeared to parallel LER's submitted by other plants, except that FNP had a pump gear reducer failure due to a blocked oil supply line.

Correspondence between the licensee, Pacific Pump, and W concerning pump operation, design changes, and modifications was reviewed and appeared satisfactory; however, no current up-to-date pump status report was available.

The licensee advised the inspector that FNP had performed five special tests per Engineering Test Procedures (ETP's) and are presently performing a series of tests on one of the charging pumps, in conjunction with the vendor. These tests are to evaluate the effects of suction pressure, discharge pressure, venting, vibration and flow. The licensee had also instrumented the "B" pump to obtain vibration readings at five different locations. This vibration data was recorded every week and was being analyzed for trends.

12. Maintenance and Modifications (Unit 1)

The licensee had an approved QA progam and procedures to control the maintenance and modification of these pumps. The Farley Nuclear Plant (FNP) Procedure OQA-WP-15, "Maintenance" was the basic controlling document. Other QA/QC procedures had been prepared to control parts, processes, qualification of personnel, inspections, housekeeping, bypassing other systems, and other maintenance activities. Vendor's technical manuals had also been used along with FNP procedures, during maintenance and modification activities. Maintenance work, except routine preventative maintenance, was authorized by "Work Requests" which had been reviewed and approved.

The inspector examined work requests and records which included the removal and replacement of shafts, gear boxes, internal assemblies, adding vibration dampers, adding counterweights, adding stiffners, replacement of oil coolers, and correction of oil leaks. Nonconformance reports had been issued for bent shafts, broken shafts, high vibration, water in the oil, replacement of oil seals, loose set screws, and rotor seizure.

Interviews with personnel and review of documents confirmed findings at other plants concerning problems encountered during operation, testing, maintenance, and replacement of parts associated with these pumps. It appears that work space for maintenance activities received minimal consideration during the original design and layout of the pump areas.

Modifications to the FNP pumps have mostly paralleled modifications made at other plants, except that FNP had installed larger oil coolers and had only installed the bearing stiffeners on the "C" pump. They plan to weld the stiffners to pump "A" and "B" when they remove the heads. Modifications were performed per "Plant Change Requests" (PCR's) and "Plant Change Notifications" (PCN's). These modifications were reviewed and approved by the technical staff and the PORC prior to implementation. It was noted that the FNP pumps have the new shafts (type 414 stainless steel, oil quenched, and tempered at 1150-1200°F). Review of documentation showed that the modifications had been reviewed, approved, and implemented by written procedures.

13. Maintenance and Modification (Unit 2A Pump)

During review of work requests, the inspector noted that the Unit 1 maintenance group had performed work on Unit 2 Charging Pump 2A. Further review and interviews revealed the following:

(1) Pump 2A experienced an oil leak during startup tests.

(2) Maintenance disassembled the pump and found a one-inch long by 0.026 inch deep longitudinal groove had been ground in the shaft; therefore, allowing oil to leak past the seal.

(3) The groove probably was inadvertently ground into the shaft surface when the shaft sleeve was removed (by grinding) during construction.

(4) The vendor's representative observed the grinding operation and reassembly of the pump internals.

(5) Neither the licensee nor the vendor's representative noticed the grinding defect prior to reassembly of the internals.

(6) The Westinghouse Site Representative was not aware of the defect until the pump leaked oil during startup.

(7) After finding the groove in the shaft, the licensee issued a "Field Deficiency Report" and shipped the assembly back to Pacific Pump.

(8) Documentation concerning the original disassembly, assembly, inspection, and evaluation by construction could not be located.

The inspector notified the licensee that he was concerned about the reinstallation of a defective shaft and why this one-inch long by 0.026 inch deep defect was not found and evaluated during the inspection following the original rework. This is considered an unresolved item pending location and review of documentation (50-364/46-01). The NRC Resident Inspector stated that he would follow this item.

14. Documentation and Records

The purchase orders, W specifications, drawings, vendors's technical manuals, pump test data, W Quality Release Forms, certificates of performance, material certification, and witnessed shop performance tests were available. Correspondence between W, Pacific Pump, the licensee, and NRC concerning the failed shaft evaluations, corrective action, and immediate remedial action was available; however, a current pump status report from W or Pacific Pump was not available.

The licensee's QA Manual, FSAR, TS, procedures, work requests, modification packages, vendor's manuals, and other information were available.

The licensee had prepared a computer printout sheet listing documentation associated with the charging pumps and their location in the site filing system.

Results of documentation and records reviewed showed that the licensee (plant site) was documenting and keeping records as described above. The records appeared to be complete and were easily retrievable, except for the Unit 2 pump as described in paragraph 13.

15. Responsibility, Qualification and Training

Personnel interviewed appeared to be qualified and knowledgable of their responsibilities and procedures associated with the charging and safety injection pumps. QA/QC, technical, administrative, and maintenance personnel appeared to be trained to perform their position functions. Training consisted of indoctrination training, training in use of clearance permits, rework permits, tool control and the use of procedures. Technical training on pumps had been obtained by on-the-job training, special lectures and demonstrations onsite by the vendor's representative, studying and using the technical manuals, and attendance at schools held at the pump vendor's plant.

16. Cracking in Pump Casing Cladding (Zion Plant)

The licensee was notified of a reported crack in the stainless steel cladding (reported to the NRC, Region III Office by Commonwealth Edison on January 14, 1980) of a Zion Plant Charging Pump (Type IJ) manufactured by Pacific Pump. The crack was found during RT examination of the pump suction end plate. The original investigations by Commonwealth Edison, Pacific Pump, and Westinghouse revealed the crack extended through the stainless steel cladding but not into the parent metal; however, additional examinations showed a slight penetration into the parent metal. Probable cause (as reported) was the manufacturing technique used to apply the cladding around a sharp inner corner. The licensee was advised that the NRC staff is presently reviewing this item, and Region II would follow this problem at the Farley Plant. The licensee was also notified of a galvanic corrosion problem found on a pump casing at the Beaver Valley Plant. (IE Report 50-334/80-26)