UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION V
1990 N. CALIFORNIA BOULEVARD
SUITE 202, WALNUT CREEK PLAZA
WALNUT CREEK, CALIFORNIA 94596

Report No. 50-344/80-18

Docket No. 50-344

License No. NPF-1

Licensee: Portland General Electric Company
121 S. W. Salmon Street
Portland, OR 97204

Facility Name: Trojan

Inspection at: Rainier, Oregon

Inspection Conducted: July 22-25, 1980

Inspector: L. E. Foster — August 29, 1980
L. E. Foster, Inspection Specialist, PAB — Date Signed

Approved by: L. E. Foster for — August 29, 1980
W. P. Shafer, Acting Chief, — Date Signed
Performance Appraisal Branch

Inspection Summary

Inspection on July 22-25, 1980, (Report No. 50-344/80-18)

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 30 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

*C. Goodwin, Jr., Assistant Vice President
C. P. Yundt, General Manager
*W. S. Orser, Manager, Operations and Maintenance
*C. A. Olmstead, Manager, Technical Services
*J. D. Reid, QA Supervisor
*R. Talbert, QA Engineer
*R. Q. Reinhardt, Engineer
*R. L. Honaker, Maintenance Planner/Scheduler
O. R. Scheel, Mechanical Foreman
M. A. Snook, Senior QA/QC Inspector
E. A. Curtis, QA/QC Inspector

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

NRC Resident Inspectors

*M. H. Malmros, Senior Resident Inspector
G. Johnston, Resident Inspector

*Attended exit interview

2. Exit Interview

The inspection scope and findings were summarized on July 25, 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

No unresolved items were identified during this inspection.

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 inspection 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 Trojan Plant 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 a Pacific Pump have been reported by the Zion Plant.

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. 46360, 46361, 46368, 46369. Interviews with licensee personnel were also held.

7. Documents Reviewed

(a) FSAR Section 6.3, "Emergency Core Cooling System"
(b) Trojan Technical Specifications, Sections 4.0 and 6.0
(c) Trojan Plant Organization Chart
(d) Trojan Plant Operations Manual, Volume 5, Section 1
(e) Purchase Order Nos. 546-CAZ-103311BN, 54-E-103310, N00045 and N12874
(f) Selected Trojan Plant Quality Assurance Procedures
(g) Selected Trojan Plant Quality Control Procedures
(h) Westinghouse (W) Equipment Specification (E. Specs) No. 677125 and and other related W Specifications
(i) Pump Periodic Operating Test Procedure Nos. POT-2 and POT-9, "Pump Performance Tests", and Test Results from September 1979 to April 1980
(j) Pump Assembly Foundation and Installation Drawings
(k) Pump Performance Curve Nos. 35096-K, 35096-J
(l) Selected Trojan Plant Maintenance Procedures
(m) Selected Maintenance Requests Concerning Charging/SI Pumps from 1975 to 1980
(n) Pump Maintenance Schedules and Lubrication Data
(o) Various correspondence between NRC (NRR), Westinghouse, Pacific Pump, and the Licensee concerning pumps problems and corrective action
(p) Corrective Maintenance History of Pumps
(q) Pump Installation and Alignment Data (1975)
(r) Pump Initial Operating Performance Data (1975)
(s) W letter Nos. NS-CE-1536 dated 9/1/77 to NRC "Report of Safeguard Pump Shaft Failures" and NS-TMA-224 dated May 8, 1980 "Safety Injection Termination"
(t) Shipping Notice Nos. 6478-S-441, 348 and 363
(u) Bechtel Procedure No. G-5 and Data Sheet G-321
(v) Various Material Receipt Inspection Reports and Nonconformance Reports

(w) Surveillance Report JDR-SR-014-79 dated March 5, 1979
(x) Welder qualification record
(y) Pump Vibration Records
(z) QA Audit Report Nos. 77-23, 77-25, and 77-53.

8. Purchase Order, Contract and Specifications

The Charging and Safety Injection Pumps for the Trojan Plant 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. Each system contains two centrifugal motor driven pumps which were supplied by W. The charging pump casings are stainless steel clad carbon steel and the SI pump casings are stainless steel. W prepared the equipment specifications (677125 and 676428), supplied vendor inspection, witnessed tests, and performed final acceptance inspections. W QA Specifications (cleaning, welding, testing, materials, etc.) were 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 plus they were subject to inspection 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. Examination of records showed that several additional purchase orders have been let with Pacific Pumps for spare parts and repair of the pumps.

Based on examination of purchase orders, specifications, and related documents it appeared that the technical and QA requirements were adequately specified and met for the original pumps and spare parts, except for the fillet radius irregularities found by W during the evaluation of the failed shafts. W letters specified that corrective action had been initiated to correct the radius irregularities; however, the inspector did not verify that this had been accomplished.

9. Surveillance and Audits

The licensee stated that the pump vendor surveillances and audits were primarily performed by Westinghouse (W) and Bechtel, their A/E. W had the contract with the pump vendor and the licensee had also contracted Bechtel to perform audits and surveillances. It was noted that W purchased the same Charging/SI Pumps for several plants; therefore, they performed the vendor surveillances and audits on pumps for these plants. The licensee stated that their Corporate Office performed audits and surveillances on W, Bechtel, and Pacific Pumps. The inspector did not examine all of these reports as they were in the Corporate Office and at W offices; however, documentation available at the site was examined. Four Bechtel reports to the licensee (dated from February 21 to December 20, 1974) described unsatisfactory material and resolutions.

The inspector examined pump performance curves, vendor test results, W quality release forms, W certifications, and correspondence between licensee, W, Bechtel, and the vendor.

Surveillances and audits of site activities associated with the charging and safety injection pumps were performed by the site QA group per QAP-18-1 and -2. This group performed audits and surveillances on storage of pump parts; instrument calibration; procedure implementation; qualification of personnel; work orders; disassembly, assembly, modifications, and Inservice Testing of Pumps. The site QA group presently consists of a supervisor, a senior QA/QC inspector, and five QA/QC inspectors. The inspector examined three audit reports (77-23, 77-25, and 77-53) and two surveillance reports (JDR-SR-014-79 and MLD-SR-006-78) in detail. These audits and surveillances included the installation, testing, replacement of parts, weld repair and calibration of instruments associated with the pumps. Based on the review of the above documentation and interviews, it appeared that adequate audits and surveillances were performed on pump activities.

10. Receipt Inspection, Storage and Handling

Receipt inspection and storage inspections were controlled and performed by the utilization of QAP-10, MRI-77 and 78, Bechtel's Field Inspection Manual Procedure G-5, and special procedure AO-12-3 which was specifically for these pumps. The inspector examined several receipt inspection reports which utilized inspection check lists. The inspection packages included hold tags, nonconformance reports, evaluations, return to vendor notices, and final acceptance tags for the pumps and spare parts. These reports had been reviewed, approved, and filed per procedures. The licensee was utilizing an IBM card system to keep track of pump parts and other pertinent information.

The licensee had issued nonconformance reports ranging from damage during shipment to rotor unbalance, plus lack of complete documentation. Review of these documents showed that the licensee had prepared reports, inspected the equipment, rejected or accepted, and specified storage. Shipping Notice No. SN-6478-S-441 concerning pump 205.B internals just specified "return to vendor for rework". Specific rework instructions or nonconformance were not specified. Other documents relating to storage, rotating pump shafts, housekeeping, lubrication, etc., were reviewed and found satisfactory.

11. Installation, Testing, Acceptance and Operation

Documentation associated with the installation, testing, and operation of the Charging and Safety Injection Pumps was examined. Trojan procedures were utilized along with the vendor's technical manuals (Nos. 2600.70 and 1100.4) and associated drawings. The manuals, procedures, and drawings appeared satisfactory. Inspections were performed utilizing check sheets to ensure that the pumps and accessories were installed, aligned and tested as specified by procedures and drawings. Startup data sheets included acceptance criteria such as speed, vibration, motor current, suction head, temperature, discharge head, pressure, flow and lube oil pressure. Reference pump performance curves were obtained for use during subsequent testing. Plant Operating Manual Volume 5 and Periodic Operating Test (POT-2-1 and POT-9-1) were the controlling procedures used during pump tests.

Operating and test data from 1975 to the present were reviewed. The tests were performed by qualified testers and were conducted per Procedure Nos. POT-2-1 and POT-9-1. Acceptance criteria was specified and the test data forms appeared to be complete.

The licensee had not previously committed to ASME Code Section XI, "Inservice Inspection"; however, they have submitted their program to NRC (Licensing) for approval. The inspector was informed that the Trojan plant was committing to ASME Section XI, 1977 through summer 1978 addenda.

Pump history records were reviewed and revealed that pump 205A (Charging Pump) had been experiencing vibration problem since initial operation. Also, all of the pumps had experienced several oil leaks. One report (MR-77-1986) identified a motor trip due to overload on pump 205A. Examination revealed that the pump had experienced a rotor seizure and shaft failure. Rotating element was removed and replaced per MI-Volume 21, Section 5, aligned and tested per MP-12-6 and POT-9-1 (July 77). Further review of logs revealed that this pump failed 3 months later (October 77) and another rotating element was installed. No reason for the failure was stated. Safety Injection Pump No. 203 B experienced a seizure of the rotating element in April 1978. The reason as described on Nonconformance Report No. 330 was that the pump was run with the suction valves closed. Correspondence between the licensee, W, and Pacific Pumps concerning the operation of these pumps was reviewed and it appeared that they are trying to resolve the vibration and shaft problems.

W letter dated June 18, 1980 presented a generic evaluation of the sensitivity of the FSAR transient analysis to emergency operating procedures and recommended the licensee change their operating procedures. Evaluation by the licensee's Generation Licensing and Analysis Department dated July 9, 1980 revealed that the W recommendation was not totally feasible; however, the licensee was developing a change to the emergency instructions pursuant to the W recommendations.

Two concerns were given to licensee management. Concerns were as follows: (1) Safety Injection Pump (203B) data taken on March 19, 1980 showed vibration of 2.5 mils and no corrective action was specified. (2) Charging Pump (205B) test data of March 7, 1980, showed that the old pressure gage had been replaced (pressure 2300 psig) with a new pressure gage which then read 2450 psig (within the limit of 2400 psig). As no evaluation of the calibration of the new or old gage was stated on the data form, the inspector questioned the reading of 2450 psig. The licensee stated that the old gage was inspected and was out of calibration. The new gage had been calibrated and the results were probably in the I&C office. Additional review will be necessary to ensure that the instrument was calibrated. The NRC Resident Inspector stated that he would follow this item and obtain resolution.

The examination of records showed that the pumps had been tested and inspected regularly as specified in POT-2-1, POT-9-1, and by Technical Specification 3/4.5.2. New base line data was obtained during testing after new parts were installed. Documentation was adequate; however, the

inspector had to go through many documents in order to obtain a chronological history of testing and operation. No single document was available to give the inspector an operating history of the pumps.

12. Maintenance and Modification

The licensee had an approved QA program and procedures to control the maintenance and modification of these pumps. Special technical procedures and instruction were issued for special maintenance and modifications. General QA Procedures (QAP-7, QAP-8, QAP-10, QAP-11, etc.) had been used to control parts, processes, qualification of personnel, inspections, and nonconformances. The vendors technical manuals were used during maintenance and repair activities. Other instructions and procedures were used to control housekeeping, clearances, job order control, cleaning agents, and by-pass of safety functions. The inspector examined maintenance, modification, and repair records which included shaft and rotor replacements, addition of vibration dampers, counterweights, and the correction of oil leaks. Results of examinations showed that replacement parts were controlled, work was performed to procedures and verification was made by QA/QC. Maintenance Request (MR) 77-1986 of July 1, 1977 entailed the removal and inspection of a rotating element and the installation of a new rotating assembly for charging pump 205A. Procedure MP-1-4 required inspections and Procedure POT-9-1 required a retest. Other typical MR's examined were Nos. 3024, 54102, 3376, 530, 1000, 1925, 5681, 0772, and 0769.

Modification and repair of the pumps had been performed both at the site and at the vendor's plant. Site modifications, repair, and design changes were controlled by procedures which required technical review, safety evaluation, and approval by licensee management. Modifications and design changes proposed and performed by W and Pacific Pumps normally were generic problems which affect all pumps purchased by the NSSS supplier. Examp' s of the above were the change in pump shaft heat treatment, fillet radius, welding procedures, threads, and split ring grooves. Other vendor and designer proposed modifications and changes such as the addition of vibration dampers, special couplings, and system parameters were reviewed and approved by the licensee prior to installation and operation. The licensee had installed stiffening ribs to the charging pump end thrust bearing housing per Engineering Instruction RDC-76-416 dated July 7, 1976. This modification was to reduce vibration and the effects were to be evaluated after tests were performed. Results of tests and evaluation were not in the pump file folders for review.

The inspector examined correspondence between W, Pacific Pumps, NRC, and the licensee concerning pump shaft failures, investigation of failures, plant modification, and corrective action proposed and initiated by the vendor (Pacific Pump) and the designer (W). W letter POR-80-59 dated May 8, 1980 notified the licensee of problems concerning dead heading the charging pump suction following a steam line break. W had also notified NRC by letter NS-TMA-2245 and stated that interim measures would be initiated until design modifications can be implemented.

The inspector noted that the requirement for concentricity of the pump shafts were specified as 0.0015 inches and that the shafts could be straightened to meet this requirement; however, information specifying the maximum runout prior to straightening was not available. The NRC Resident Inspector stated that he would followup this item. Current information regarding shaft failure status, other investigative results, and final resolution of the problem was not available for review. A current status or progress report from W and Pacific Pumps concerning the shaft problem needs to be issued. The charging pump shafts at Trojan, based on information provided by W and Pacific Pumps, include an old shaft in pump S/N 46360 and a retempered shaft (Part No. HT53395) in pump S/N 46361.

13. Inservice Testing (IST)

The licensee stated that they have submitted an IST program to NRR which commits Trojan to ASME Section XI-1977 and Summer 1978 addenda, but have not received approval. Examination of documentation and discussion with licensee personnel revealed the following:

(a) Test procedure Nos. POT-2-1 and POT-9-1 have been developed and was being implemented.
(b) The above procedures appear to meet the minimum IST requirements (IWP test program).
(c) If TS requirements are not met, the pump is declared inoperative.
(d) Pumps are tested on a monthly, quarterly, and yearly schedule as required by ASME Section XI and by Procedure Nos. POT-2-1 and POT-9-1.
(e) Test data is reviewed by the Maintenance and Support Engineering Sections. W and Pacific Pump are supplied data as requested..
(f) Values obtained from test programs are used in accessing operational readiness and preventative maintenance of centrifugal pumps.
(g) Test information is used by plant management to identify deteriorating equipment and to schedule corrective action.

The inspector examined pump test data from tests performed from September 1979 tp April 1980 and found tests were performed, evaluated, and approved as required by Procedure Nos. POT-2-1 and POT-9-1.

14. Documentation and Records

The purchase orders, W specifications, drawings, vendor's technical manuals, and pump test curves were all available for the inspectors review. W audits of Pacific Pump Division during the fabrication of pumps was not available for examination; however, W Quality Release Forms, Certificate of Performance, material certification, and witnessed shop performance tests were available. Several Bechtel documents were available; however, the documents at the site did not give the inspector an overall view of Bechtel's involvement during the design, fabrication, and testing of these pumps.

All correspondence between the licensee, W and Pacific Pump was not available as most of this correspondence was filed at the licensee's Corporate Office. Some correspondence concerning the failed shaft evaluations, corrective action, and immediate remedial action was available; however, a current status report from W or Pacific Pump was not available.

Licensee's QA Manual, FSAR, TS, procedures, and other instructions were available; modifications, repair, maintenance, and test data information was filed in folders which were located in different offices and maintained by different personnel.

Results of documentation and records reviewed showed that the licensee (plant site) was documenting and keeping records as described above. The history of the pumps was not being kept in a chronological file. A chronological file would enhance the timely resolution of potential problems.

15. Responsibility, Qualification and Training

Personnel interviewed appeared to be qualified and knowledgeable of their responsibilities and procedures associated with the charging and safety injection pumps. QA auditors, NDE technicians, maintenance personnel, and welders training appeared satisfactory. Training consisted of indoctrination training, training in use of clearance permits, rework permits, tool control and the use of procedures. Training on pumps had been given by the vendors representative and the technical manuals were being utilized by maintenance personnel. The inspector discussed the need for training of new technical engineers with the licensee. The lack of a chronological pump history file makes it difficult to evaluate pump problems.

16. Cracking in Pump Casing Cladding (Zion Plant)

The licensee was notified of a reported crack in the stainless steel cladding (reported to RIII by Commonwealth Edison on January 14, 1980) of a Zion Plant Charging Pumps (Type IJ) manufactured by Pacific Pump. The crack was found during RT examination of the pump suction end plate. Investigations by Commonwealth Edison, Pacific Pump, and Westinghouse revealed the crack extended through the stainless steel cladding but not into the parent metal. 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 V would follow this problem at the Trojan Plant.