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6-18-98 P.06

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R4-5A14

R-IP2-1998-05247

Significance: C - CORRECT ONLY

K

Reportability:

Operability:

CR Status: Closed on December 01, 1998

Classification Code: NON-SIGNIFICANT

Description:

9805247 - DURING THE PERFORMANCE OF PTQ26B FOR 22 SERVICE WATER PUMP PMT98-01596. THE PUMP WAS STARTED WITH MAINT PRESENT. THE PUMP MADE CLUNKING NOISE AND THE PACKING GOT HOT WHEN IT WAS RUN AS PER MAINT. 22 PUMP WAS SECURED AND THE LINE UP RESTORED AS PER SRO. NO DATA AS COLLECTED BUT PUMP TEST FAILS. WO STILL IN MPT STATUS. MAINT TO EXAMINE PUMP AGAIN.

Responsible Dept: ENG-Engineering Support Mgmt

CA&A Contact:

Originated: 06/18/1998 by Hughes, Gerald L, ENG P&C-Equip Reliability Staff

Affected Systems:

Affected Equipment:

R-IP2-1998-05248

Significance: C - CORRECT ONLY

Reportability:

Operability:

CR Status: Closed on October 20, 1998

Classification Code: NON-SIGNIFICANT

Description:

9805248 - DURING PREP FOR 22 DEGASSING PUMP RUN FOUND THE FOLLOWING:
N-714 / CA-718 WERE FOUND CLOSED WITH CAUTION TAGS STATING VALVES THROTTLED. THESE TAGS WERE HUNG FOR CONFIGURATION CONTROL DUE TO COL JD SOP CALLING FOR THESE VALVES TO BE OPEN. CAUTION TAG 97-401 WAS IN THE FIELD. CCR INFORMED VALVES LEFT AS FOUND UNTIL ENG. INPUT RECEIVED

Responsible Dept: CRG/CARB/OSRC

CA&A Contact:

Originated: 06/18/1998 by JONES, RICHARD P, Operations Watch Staff

Affected Systems:

Affected Equipment:

R-IP2-1998-05268

Significance: C - CORRECT ONLY

Reportability:

Operability:

CR Status: Closed on August 24, 1999

Classification Code: NON-SIGNIFICANT

Description:

9805268 - THE TEST GROUP WAS USED TO OPERATE 22 SWP AFTER MAINTENANCE (REPACK) USING THE MONTHLY TEST AS A PMT. THE FIELD OPERATORS CHALLENGED THIS PRACTICE AND IT WAS NOT RESOLVED. PAST PRACTICE HAS BEEN FOR OPERATIONS TO PERFORM THIS TESTING,(PMT'S). THE MAINTENANCE DID NOT HAVE A FORMAL PROCEDURE TO ADJUST THE PACKING GLAND WHILE OPERATIONS MUST USE AN SOP. THE SOP IS 24.1 REV.32 SECTION 3.5 SERVICE WATER PUMP PACKING ADJUSTMENT. THIS WAS BROUGHT UP AS A PRECONDITIONING ISSUE, POOR MAINTENANCE

Responsible Dept: E-Plan Mgmt

CA&A Contact:

Originated: 06/18/1998 by JONES, RICHARD P, Operations Watch Staff

Affected Systems:

Affected Equipment:

F-14



CONDITION REPORT

CR-IP2-1998-05247

Originator: Hughes, Gerald L

Originator Phone: 0

Originator Group: ENG P&C-Equip Reliability Staff

Operability Required: N

Supervisor Name: SHEIKH, ARSHAD

Reportability Required: N

Discovered Date: 06/18/1998 00:00

Initiated Date: 06/18/1998 00:00

Condition Description:

CR Date: 06/18/1998 11:42

CR Entered Date: 06/18/1998 11:57

DURING THE PERFORMANCE OF PTQ26B FOR 22 SERVICE WATER PUMP PMT98-01596. THE PUMP WAS STARTED WITH MAINT PRESENT. THE PUMP MADE A CLUNKING NOISE AND THE PACKING GOT HOT WHEN IT WAS RUN AS PER MAINT. 22 PUMP WAS SECURED AND THE LINE UP RESTORED AS PER SRO. NO DATA WAS COLLECTED BUT PUMP TEST FAILS. WO STILL IN MPT STATUS. MAINT TO EXAMINE PUMP AGAIN.

Immediate Action Description:

SWS AND TP ENG INFORMED.

Suggested Action Description:

TRENDING (For Reference Purposes Only):

Trend Type

IP

EQ

Trend Code

IP-TEST FAILURES

EQ-XA



ADMIN

CR-IP2-1998-05247

Initiated Date: 6/18/1998 0:00

Owner Group :ENG-Engineering Support Mgmt

Current Contact:

Current Significance: C - CORRECT ONLY

Closed by: e-CAPTain, CRS

12/1/1998 0:00

Summary Description:

199805247 - DURING THE PERFORMANCE OF PTQ26B FOR 22 SERVICE WATER PUMP PMT98-01596. THE PUMP WAS STARTED WITH MAINT PRESENT. THE PUMP MADE A CLUNKING NOISE AND THE PACKING GOT HOT. WHEN IT WAS RUN AS PER MAINT. 22 PUMP WAS SECURED AND THE LINE UP RESTORED AS PER SRO. NO DATA WAS COLLECTED BUT PUMP TEST FAILS. WO STILL IN MPT STATUS. MAINT TO EXAMINE PUMP AGAIN.

Remarks Description:

Closure Description:

PCRS Conversion



ASSIGNMENTS

CR-IP2-1998-05247

Version: 1

Significance Code: C - CORRECT ONLY

Classification Code: NON-SIGNIFICANT

Owner Group: ENG-Engineering Support Mgmt

Performed By: e-CAPTain, CRS

12/01/1998 00:00

Assignment Description:



CORRECTIVE ACTION

CR-IP2-1998-05247

CA Number: 1

Group

Name

Assigned By: CA&A Staff

E-CAPTAIN, CRS

Assigned To: ENG-Engineering Support Mgmt

Poirier,Thomas E

Subassigned To :

Originated By: E-CAPTAIN, CRS

11/2/1998 00:00:00

Performed By: Poirier,Thomas E

12/1/1998 00:00:00

Subperformed By:

Approved By:

Closed By: Poirier,Thomas E

12/1/1998 00:00:00

Current Due Date: 12/02/1998

Initial Due Date: 12/02/1998

CA Type: DISP - CORR ACTION

Plant Constraint: NONE

CA Description:

CITRS/CRS CONVERSION - You are assigned ownership of this event and the lead for all subassignments, per SAO-112.
(CAG)

CA REFERENCE ITEMS:

Type Code

CRS ID

Description

80304



CORRECTIVE ACTION

CR-IP2-1998-05247

Response:

Priority 3 Analysis Completed.
Significance Level 3 Report

The information below was Engineering's (Edson White) SL-2 response to CR # 199805612 for this same problem. This CR is being closed to that response and the corrective actions to be completed under CR # 199805612.

Stehen B. Carpenter 12/1/98

The service water pumps currently in service are recent installations and were manufactured by the Johnston Pump Company. In general this new service water pump is a ruggedized version of the previous service water pumps manufactured by Layne and Bowler, and Aroura.

The Johnston pump is configured with a thermoplastic guide bearing mounted in the bottom of the pump stuffing box. This guide bearing relies on leak off through the packing gland for cooling. The stuffing box is packed with 5 rings of John Crane 1625 graphite packing. A lantern ring is installed located in between the three bottom rings of packing and two top rings.

We have been experiencing problems with this stuffing box / packing gland / bearing arrangement. Changes have been made to the design and clearance of the bearing located in the bottom of the stuffing box. We have also tried different sizes and styles of packing. The current design bearing is identical to the originally supplied design with one exception. The bearing radial clearance has been increased. This arrangement is currently installed on 22, 23, 24 and 25 service water pumps. Pump 21 is as originally supplied with the smaller clearance in the upper bearing and pump 24 has a bearing with a fluted design.

Problems with these service water pumps stem from the design requirement of a relatively high amount of flow through a packed stuffing box essentially designed for minimal leak off. Normally, one could loosen the packing gland studs and this would allow for an increase in packing box leak off. In the case of these pumps, the packing "stack" is compressed not only from the packing gland, but also from the force of the 100 psi water pressure acting on the bottom. The resultant force on the packing stack from this water pressure is over 400 pounds. This situation creates difficulty in obtaining a high amount of pump packing leak off.

The original short life of these service water pumps was due to problems regarding stuffing box leak off and stuffing box bearing problems. When the pumps were removed from service for packing replacement, problems were noted in the stuffing box bearing. This bearing was observed to have extruded up into the packing area of the stuffing box. A review of the original design had shown that the original bearing clearance was too tight. The immediate fix for this problem was to increase the clearance of the stuffing box bearing. A further review of this problem was performed and a decision was made to install a bearing with a fluted design. Upon installation of this fluted design, we experienced problems associated with getting sufficient leak off through the stuffing box. High leak off temperatures resulted. The lower leak off flow was attributed to the bearing no longer acting as a throttling device and the subsequent higher pressures on the packing. This higher pressure resulted in a decrease in packing leak off.

We have made attempts to increase the leak off flow of these service water pumps. The original packing supplied was six rings of 7/8 inch John Crane 1625 G graphite packing with Teflon. One ring of packing has been removed and we now have 5 rings of 7/8 inch 1625G packing. We have tried John Crane style 1635, a graphite packing without Teflon. The leak off did not increase with this packing and 1625G was reinstalled. We installed 6 rings of 7/16th inch John Crane 1625G. This packing was installed on a pump with fluted bearings. The leak off was excessive. We reinstalled 5 rings of 7/8 inch packing.

The p --- see attachment for rest ---

Subresponse :

Closure Comments:

N/A

Attachments:

Resp Description

Priority 3 Analysis Completed.

Attachment Header

Document Name:

P2-1998-05247 CA-00001

Document Location

Resp Description

Attach Title:

Priority 3 Analysis Completed.

Priority 3 Analysis Completed.

Significance Level 3 Report

The information below was Engineering's (Edson White) SL-2 response to CR # 199805612 for this same problem. This CR is being closed to that response and the corrective actions to be completed under CR # 199805612.

Stephen B. Carpenter 12/1/98

The service water pumps currently in service are recent installations and were manufactured by the Johnston Pump Company. In general this new service water pump is a ruggedized version of the previous service water pumps manufactured by Layne and Bowler, and Aroura.

The Johnston pump is configured with a thermoplastic guide bearing mounted in the bottom of the pump stuffing box. This guide bearing relies on leak off through the packing gland for cooling. The stuffing box is packed with 5 rings of John Crane 1625 graphite packing. A lantern ring is installed located in between the three bottom rings of packing and two top rings.

We have been experiencing problems with this stuffing box / packing gland / bearing arrangement. Changes have been made to the design and clearance of the bearing located in the bottom of the stuffing box. We have also tried different sizes and styles of packing. The current design bearing is identical to the originally supplied design with one exception. The bearing radial clearance has been increased. This arrangement is currently installed on 22, 23, 24 and 25 service water pumps. Pump 21 is as originally supplied with the smaller clearance in the upper bearing and pump 24 has a bearing with a fluted design.

Problems with these service water pumps stem from the design requirement of a relatively high amount of flow through a packed stuffing box essentially designed for minimal leak off. Normally, one could loosen the packing gland studs and this would allow for an increase in packing box leak off. In the case of these pumps, the packing "stack" is compressed not only from the packing gland, but also from the force of the 100 psi water pressure acting on the bottom. The resultant force on the packing stack from this water pressure is over 400 pounds. This situation creates difficulty in obtaining a high amount of pump packing leak off.

The original short life of these service water pumps was due to problems regarding stuffing box leak off and stuffing box bearing problems. When the pumps were removed from service for packing replacement, problems were noted in the stuffing box bearing. This bearing was observed to have extruded up into the packing area of the stuffing box. A review of the original design had shown that the original bearing clearance was too tight. The immediate fix for this problem was to increase the clearance of the stuffing box bearing. A further review of this problem was performed and a decision was made to install a bearing with a fluted design. Upon installation of this fluted design, we

experienced problems associated with getting sufficient leak off through the stuffing box. High leak off temperatures resulted. The lower leak off flow was attributed to the bearing no longer acting as a throttling device and the subsequent higher pressures on the packing. This higher pressure resulted in a decrease in packing leak off.

We have made attempts to increase the leak off flow of these service water pumps. The original packing supplied was six rings of ½ inch John Crane 1625 G graphite packing with Teflon. One ring of packing has been removed and we now have 5 rings of ½ inch 1625G packing. We have tried John Crane style 1635, a graphite packing without Teflon. The leak off did not increase with this packing and 1625G was reinstalled. We installed 6 rings of 7/16th inch John Crane 1625G. This packing was installed on a pump with fluted bearings. The leak off was excessive. We reinstalled 5 rings of ½ inch packing.

The problem of low flow is most prevalent when the pump is first packed. At this time areas of the packing are soft and easily extruded by the stack forces onto the pump shaft. In some areas, the packing is making relatively hard contact to the pump shaft and creating heat. This condition results in high gland leak off temperatures until the packing has worn in where the hard rubs have been minimized and the amount of heat generated in the packing stack is reduced. Indian Point is not the only plant experiencing problems with service water pump packing break in. Some plants have placed external cooling water on the packing gland for the first 24 hours of operation. Our pump manufacturer had endorsed this practice. Our practice is not to use external cooling. We have been monitoring the temperature of the packing gland with a not to exceed temperature of 180 degrees F. This temperature limit is conservatively lower than the stuffing box components can withstand.

The following information was Engineering's (Edson White) response to CR # 199805612

The pump shaft and shaft sleeve is manufactured from a stainless steel know as Nitronic 50. Nitronic 50 can withstand temperatures over 1000 degrees. John Crane 1625 packing is designed for service over 600 degrees F. The thermoplastic bearing is the limiting factor. This bearing can withstand temperatures up to 230 degrees F.

With the current design of our pump, high temperatures upon initial start up can be expected. The 180 degree limit allows the pump packing to break in. If steaming is observed, regardless of the packing temperature, the pump should be shut down. Steaming means that temperatures exceed 212 degrees F. Experience has shown that once a pump has had sufficient break in time, the leak off temperature does not exceed 120 degrees.

A long term solution to this problem is currently under development. A test rig has been fabricated and different packing arrangements, leak off designs and throttle bushings are being pursued. The goal of this project is to eliminate the high heat experienced in the

packing gland during the break in period and to extend the life of the packing and stuffing box. The anticipated completion of this study is several months away.

The pump bearing manufacturer, Thordon Bearings Inc., recommends a bearing cooling flow of 1 gallon per minute of shaft diameter. Our service water pump bearings are 2-7/16ths in diameter. This would correspond to a cooling requirement of approximately 2.5 gallons per minute. In a letter faxed to Con Edison on April 14, 1998, Thordon revised this requirement to 1/2 gpm per inch of shaft diameter or 1-1/4 gpm total. Measurements taken on our pumps in July of this year are shown below.

In order to increase the leak off rate and aid in the breaking in of the pump packing, we proposed and installed different sized packing in 23 service water pump. The packing type is the same, John Crane 1625G. The packing is arranged with three rings of 7/16ths on the bottom of the stuffing box, the lantern ring, a 7/16ths ring of packing, and two rings of 1/2 inch packing on the top. This arrangement increased the packing leak off and provides additional cooling for the bearing and stuffing box.

This arrangement has worked well as an interim repair. The leakage out of the packing gland, while necessary for bearing cooling has the appearance of an excessive amount. Our current plan is to design and test an improvement to this system and then install into the service water pumps. A large leakage past the packing will also result in higher than normal packing wear and lead to more frequent packing change

Recommendation:

The pump was repacked with 5 rings of John Crane 1625G. If this packing is replaced in the near future, repack with 4 rings of 7/16ths packing and 2 rings of 1/2" packing. Do not repack the pump unless the packing leak off is measured to be over 2.5 gpm.



CORRECTIVE ACTION

CR-IP2-1998-05247

CA Number: 2

Group	Name
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Assigned By: CA&A Staff E-CAPTAIN, CRS

Assigned To: ENG-Engineering Support Mgmt Poirier, Thomas E

Subassigned To :

Originated By: E-CAPTAIN, CRS 7/31/1998 00:00:00

Performed By: Poirier, Thomas E 11/3/1998 00:00:00

Subperformed By:

Approved By:

Closed By: E-CAPTAIN, CRS 11/3/1998 00:00:00

Current Due Date: 08/14/1998

Initial Due Date: 08/14/1998

CA Type: PERFORM CA

Plant Constraint: NONE

CA Description:

As per TPC 98-41, SAO 132, you retain the lead for this OIR. Please make subassignment to engineering for failure analysis. (JH)

CA REFERENCE ITEMS:

Type Code	Description
CRS ID	4758

Response:

Will be answered under SL3 assignment. SBC 11/3/98

Subresponse :

Closure Comments:

N/A