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                    12/14/99   PHC ②

B Recirc Pump Seal Root Cause info

see long text for confirmation.
CONDITION DESCRIPTION. Performance monitoring of the 1B-P-201, B Reactor Recirculation Pump, detected a slight degradation in performance of the # 2 seal associated with this pump following the startup from Cycle 09 Mid-cycle Outage (i.e., First week of September 1999). Normal pressure for the second stage seal cavity, based on historical data, should be approximately 490-495 psi. Following the mid-cycle startup, # 2 seal cavity pressure ranged between 481-489 psi. A downpower to 60% power was conducted this past weekend (12/10-13/99). Pressure in the # 2 seal cavity has still not recovered to the pre-downpower value (i.e. 482 psi pre, 475 psi post). Seal behavior appears similar to that experienced on the 1A-P-201 earlier this cycle. That seal was replaced during the August/September 1999 Mid-Cycle outage. Initial M-Rule classification is not a functional failure. Seal is operating at off-normal conditions however it is still capable of performing its design function.

IMPACT. As experienced with the 1A-P-201 earlier this cycle, a degraded seal can cause increased Drywell Floor Drain (DWFDF) and/or Drywell Equipment Drain (DWDF) flows. At the present time, the situation needs to be closely monitored. DWFDF (i.e., UNIDENTIFIED LEAKAGE) is slowly trending upward at a rate of approximately 0.0075-0.01 gpm/day, with a present value of 0.18665 gpm (per CRIDs Historian). Plant shutdown is required if DWEDF reaches a rate of 1.25 gpm. . REQUIREMENT NOT MET:

SUSPECTED CAUSE. Based on 1A-P-201 seal inspection, significant checking of seal faces noted believed to be due to air intrusion and/or improper venting methodology. Specifically, the current methodology has the pump seal cartridge being vented before and after the pump has been started. Seals should not be vented after the pump has been started. Actual root cause of seal off-normal performance cannot be determined until it is disassembled and inspected.

RECOMMENDED CORRECTIVE ACTIONS.
a) Place the order created from this notification in the Forced Outage schedule and/or RFO9 scope. NAP-55 is being processed by system
system engineering in parallel with this notification. b) Ensure that a CM Order is created for performance of the field work to replace the seal and to disassemble and inspect the off-normal seal
(ensure vendor support FLOWSERVE -is on-site during disassembly.
c) Ensure TS Order is created for cause evaluation.
d) System Engineering will continue to monitor seal performance through cycle 09.

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NUD2L 06.26.2000 16:16:17 during power assention HOP noted B recirc pmp vibs on crids pt A2603
Radial vibs to be 9.1 mils at 98 mlb/hr (normal for the B pmp) when flow was raised to 100 mlb/hr, hop observed vibs to increase
at a steady rate up to 12 mils. hop immediately reduced flow to 99 mlb/hr. vibs were noted to reduce to 11 mils. hop continued to reduce
until 10.5 mils were observed. this ended at a core flow of 92.5 mlb/hr
and a power level of 88%. hop is holding here for further investigation
System engineer and maintance have been notified. Maplewood labs also
called in to take further vib analysis.

NUR2C 06.27.2000 08:20:45
NUT1F 06.29.2000 18:31:26 Changed setpoints IAW WB6 and Engineering to 20mils for alert and
22 for danger. Span increased to 0-25mils

JXF: Review vibs data, see long text Review the vibration data for the event occuring 6/26/2000 and
determine:
1) What the cause of the vibration may be.
2) Is the vibration level we are currently operating acceptable?
3) Sugggested CM maintenance we should do to fix the problem, if any.

Description of Condition: During Hope Creek power ascension, vibration levels on the B Reactor ReCirc Pump increased to ~12 mils displacement. This happened following the Operators reaching a core flow state of 100M Lbm/Hr on their way to full power. At that point the Operators reduced core flow until vibration levels were reduced to approximately 10.5 mils displacement. Vibration recording equipment was connected to the plant installed vibration monitoring system to collect data. Design Change Package was initiated to revise, upward, the Alert and Danger set points to allow for power ascension.

Evaluation: Evaluation Manager has asked the Vibration Program Manager to review the vibration data collected during this event. Comment on the following questions:
1.) What the cause of the vibration may be: During the RF09 outage, a motor pump re-alignment was performed. The purpose for this action was to improve the so-called high vibration levels seen on the machine. An outside consulting firm against the recommendation of the Vibration Program Manager recommended these activities. This was based on discussion previously had between the System Manager, Pump OEM, and Vibration Program Manager on the vibration levels measured on the machine at that time. Prior to the alignment activities the Pump OEM stated that the vibration levels seen at that time were well within their expectations. It also needs to be stated that the misalignment between the motor and pump had been documented several years earlier with no actions performed to correct. Additionally the levels seen, especially the 1X orders, is affected by run out in the coupling, which is the same area from which the proximity probes sense motion. This run out is evident during slow roll or start up in the machine in the data. More commonly called glitch it is a combination of mechanical and electrical. The mechanical portion is hard run out, measured from the eccentricity of the coupling to the shaft. The electrical is due to surface or material imperfections that the proximity probe sees as motion of the shaft or vibration.
It is the opinion of the Vibration Program Manager that the current vibration levels are the result of the alignment. The correction centered the pump and motor to the point that the bearings are unloaded allowing the pump to be influenced by changes in flow. This is evident in the data during speed increases; amplitude at 1X orders remains steady while amplitude at 10 X (2X Vane Pass) Orders fluctuates with speed. It is the opinion of the Vibration Program Manager that imbalance is not the cause for the vibration levels.
2.) Is the vibration levels we are currently operating acceptable: The vibration levels prior to the outage were acceptable. This is based on history (levels remained relatively stable), and discussions within pump vendor. The levels

currently seen are not acceptable based on the before alignment versus post alignment results. Data collected during the power ascension shows that the overall levels are significantly (>17.0 mils) elevated between 1444 RPM and 1482 RPM rather consistently. Obviously operation in this speed range should be avoided, this may pose a challenge to the plant during down powers for testing. Since the 1X component has remained relatively stable, no indications of looseness or excessive clearance seen, there does not appear to be any damage done at this time to the machine. Obviously lowering vibration levels in any machine when reasonably possible is recommended to improve long-term health of the equipment.

3) Suggested CM maintenance we should do to fix the problem, if any: The OEM vendor has a technical paper that strongly advises against adding weight to the machine. This appears to be based on experiences they have seen when balance corrections where attempted. Based on the relative stability of the 1X order component through the speed range it is not in the opinion of the Vibration Program Manager a balance problem. Knowing this information it is not advised to attempt placing a balance shot on the machine. This is not to say that adding weight will not reduce the levels. Weight added to the machine could drive the vibration down by masking, creating an imbalance whose phase angle is opposite the true vibration response. Considering all the information provided in the beginning of this response what is recommended is as follows. Inspect coupling especially run out. These inspections should include checking for any eccentricity of the coupling. Also checking as much as possible for any surface imperfections in the area or path of the proximity probe tip. Replacement of the coupling if possible would be advisable; this should be performed during a refueling outage. Limit operation of the machine within the 1444 to 1482 RPM speed band where excitation of the vane passing harmonic occurs. This will be an operator challenge since there is a need to be in this range during down powers for system testing.