CAUSE ANALYSIS

NOP-LP-2001-03

CR Number 02-01523

Category / Eval Code: CA

Condition Description and Cause Basis:

Hardware / Degraded Condition Resolution Required? ☐ Yes ☑ No

If Yes, select one: ☐ Repair ☐ Rework ☐ Scrap ☐ Use-As-Is

PROBLEM STATEMENT:
During the performance of DB-PF-03065, Pressure and Augmented Leakage Test, inner casing gasket leakage was observed from RCP 1-1 and RCP 1-2 via the respective casing gasket collection system. CR was generated to ensure adequate review of this leakage, to address operational readiness issues, and to justify/plan RCP inner and outer gasket replacement.

DISCUSSION.
Inner gasket leakage has been observed for a prolonged period of time. Prior to 1998 leakage of the inner/outer gasket was checked at Mode 3 during the heatup of the plant post each refueling outage. Per procedure DB-OP-6900 (Plant Heatup) operator was directed in step 4.104.5 to notify Operations Superintendent and to forward the information to System Engineer in the event that the leak was detected. No records have been found to document the leak rate prior to 1996. During 10 RFO leakage was observed and quantified on RCP 1-1. Starting from 1998 gasket leakage was quantified per newly developed DB-PF-03065, Pressure and Augmented Leakage Test. Data collected during 10 and 11 RFO is tabulated below.

Pump□Procedure□Cycle
Date□Leakage
RCP 1-1□DB-OP-06900, Section 4.104□Cycle 11
5/10/98□Pint
RCP 1-2□DB-OP-06900, Section 4.104□Cycle 11
5/10/98□½ gallon
RCP 2-1□DB-OP-06900, Section 4.104□Cycle 11
5/10/98□pint
RCP 2-2□DB-OP-06900, Section 4.104□Cycle 11
5/10/98□pint
RCP 1-1□Bonnet Leakage, much snow in general area. Studs 7-11 and 12 were VT-3 examined. Re-torque.

All four RCPs studs were relaxed and re torqued.
MWO 7-96-0650-01 was issued to assist in leak testing of RCP 1-1 seal.□10 RFO
5/1/96□As found was 5500 SCCM at 50 psig, After torquing As left was 15 SCCM at 50 psig.

Leakage results performed during 12RFO and 13RFO are listed below as follows:

RCP □12 RFO Leak rate in GPM.□12 RFO RCS Test pressure□13 RFO Leak rate in GPM.□13 RFO RCS Test
pressure.

1-1□0.003991□265□0.010644□893
1-2□0.010112□265□0.031932□893
2-1□0.001774□1500□Not performed□Not Applicable
2-2□0□1500□Not performed□Not Applicable

C3

Since 1998 (11RFO) the test is performed per DB-PF-03065 for RCP 1-1, 1-2, 2-1, and 2-2. The inner-outer RCP gasket isolation valves are normally closed. First part of test consists of measuring accumulated leakage by collecting and measuring leakage observed at each gasket leak off point. This test is performed in Mode 3 while RCS pressure provides the driving force.
If steady state flow is observed from the gasket leak off line, then flow rate is determined. If no flow is observed, then the isolation valves are closed. After one hour the valves are opened and accumulated leakage measured.
The purpose of the test is to determine if the inner RCP pump gasket is leaking and to ensure that the leakage detection system is operable, e.g., not blocked. This is in accordance with ASME IWA-5243 (Components With Leakage Collection System). Per IWA-5243 "When leakages from components are normally expected and collected (such as valve stems, pump seals, or vessel flange gaskets) the VT-2 visual examination shall be conducted by verifying that the leakage collection system is operative".

Based on the test results leakage through the inner gasket was identified. Other than Technical Specifications limits of 10 gallon identified and 1 gallon unidentified RCS leakage, there are no leakage criteria in place to determine condition of the inner gasket. If the outer gasket is not leaking and Technical Specifications are met, there is no requirement to repair the inner gasket. It is the nuclear industry practice that inner gasket should be recommended for replacement if significant steady leak is present. As long as the outer gasket is not leaking the condition of the Reactor Coolant Pump is satisfactory and no actions are required.

As a result of the identified leak each RCP bolted connection was visually examined for evidence of external leakage. These additional examinations provide verification of the RCS system integrity. To ensure that the outer gasket is not leaking the insulation has been parialy removed from the Reactor Coolant Pumps and outer gaskets inspected. No evidence of leakage was noted. Since the inner gasket leak was detected additional actions have been initiated to mitigate the inner gasket leakage. WO 02-002810-000 was issued to re-torque all four RCPs studs and to measure as left stud elongation data for all RCPs studs. Adequate PMs are in place to re-torque RCP studs during RCP seal replacements. These PMs are PM 2416 for RCP 1-1, PM 2415 for RCP 1-2, PM 2414 for RCP 2-1, and PM 2413 for RCP 2-2. In addition PM 3193 is in place to perform stud inspections for all RCPs during each refueling outage.

During 12 RFO, VT-2 visual examination was performed in Mode 5 and 6 per PM 3193. Three studs with small boron accumulation were identified on RCP 1-1 in the area of the pump's discharge. The same three studs were identified as effected by boron during 11RFO. The studs were removed during 11 RFO, cleaned and retorqued. Any evidence of boron accumulation during the VT-2 normally requires stud removal and performing of VT-3 of the RCP bolting. An ultrasonic examination of the three studs was performed to determine their condition. All three studs were found in good condition. This issue is discussed in CR 2000-0869. Subsequent visual examination performed during 13RFO of the affected area did not identify any new boric acid present on the affected studs. CR 2000-0869 is the only documented RCS leakage associated with the inner and outer RCP gasket since 1986 when the gaskets were last replaced. Prior to 1986 there are no records of gasket replacement.

Conclusions and recommendations.
Identified leakage from the Reactor Coolant Pump gasket drain lines per DB-PF-03065, Pressure and Augmented Leakage Test is within the expected rate.
Adequate PM program is in place.
Actions performed per WO 02-002810-000 will ensure that all four RCPs studs have properly torque.
SYME will monitor RCP gasket leakage by tabulating DB-PF-03065 test results in the System Performance Book.
Actions will be taken to recommend gasket replacement program.

APPARENT CAUSE.

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The cause of the leakage can not be positively identified without disassembly of the pump. The apparent cause of the leakage is associated with the aging of the gasket material/bolt relaxation.

CORRECTIVE ACTIONS.

Restretch the bolts on all Reactor Coolant Pumps (WO 02-002810-000).

Follow up Action is issued to SYME to recommend gasket replacement program and to incorporate the program at Davis Besse.

Process Code	Trend Codes					
HDW		(If cause is T or W)				
Activity Code		Cause Code	Component Code Type	ID#	Cause Org	
0575	Primary	T00	M	68	NONE	None
	Secondary					
	Tertiary					

Completed By: SIEMASZKO, A

Date: 5/24/2002