CAUSE ANALYSIS

NOP-LP-2001-03

CR Number 03-00042

Category / Eval Code: CA

Condition Description and Cause Basis:

Hardware / Degraded Condition Resolution Required? ☐ Yes ☑ No

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

Problem Statement:

While performing an energized motor rotational test for Reactor Coolant Pump 1-2, the RCP ran backwards.

Evaluation of Facts and Data:

Reactor Coolant Pump motor 1-2 was being replaced under Work Order 02-004138-015. An uncoupled run of the motor from the pump is performed to ensure that the rotation of the motor is satisfactory upon replacement of the motor. After the motor was replaced, a temporary hookup of the wires to the incoming electrical lines is established to complete this testing. This is a planned activity as the directional accuracy of the motor may require retermination. In order for these motor leads to be hooked up, a Motor Rotation meter is inserted on these leads while the shaft of the motor is turned in the correct rotation. The turning of the motor shaft is done by inserting a bar into the RCP and manually turn the shaft. As this shaft turns, its residual magnetism will induce a current in the stator that can be captured and seen as a deflection on the phase rotation meter. The unit of measure for this is called Henry's. When we turn the shaft, however, the Induction we are setting up is very low, sometimes in the area of milli-Henry's (mH). The accuracy of this meter is unknown, however what is known is in order to deflect the needle on the meter you must be greater than 1 mH of Induction. In larger motors, the probability of this measurement being in the milli-Henry's is likely. During this shaft rotation, only .03mH was seen, which is much less than the required minimal needed. The decision was made to install the power connections as needed and proceed based on the following information:

? Internally to the motor is a reverse anti-rotational device. This device does not allow the motor to run in the wrong direction.

? During the normal start-up of this motor, the in-rush current during the start of this motor of 1968 amps, with a sustained current of 1300 to 1630 amps for the first 8 seconds before leveling off. These current readings are variable due to the line voltage. This was recorded on the last uncoupled run in May 1996. The vendor stated this is the normal value of in-rush current to be seen with this type of motor.

? Protective relays in the circuit would not allow an excessive amount of time for the motor to operate in the event of the in-rush of current.

During this start up for this particular uncoupled run, the value measured was 1830 amps for a sustained period of 3.5 seconds. At this point, a reactor operator turned off the pump. An annunciator alarm for relay actuation of the protective relays was not received, indicating that the relay was not actuated due to high current.

The vendor has stated, the design criteria basis for these motors are engineered to withstand an in-rush current of 1950 Amps for a sustained time of 10 seconds against the anti-rotational device. During the event, this criterion was neither breached nor compromised as data can prove.

Apparent Cause:

The Motor Rotation meter at the time of use for this particular motor could not see the correct phasing sequence as needed. This was due to the fact the motor needed to have an initial run time of four hours to

C20

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induce the residual magnetism, according to the vendor. This particular Motor Rotational meter could not be used on an initial installation of a motor.

The relay targets that were seen and described in this Condition Report came from outside factors of the event, not because of the event. After analysis of the data, mechanical agitation (circuit breaker opening) was the cause of the targets being seen.

Process Code	Trend Codes						
HDW				(If cause is T or W) Component Code			
Activity Code		Cause Code		Type	ID#	Cause Org	
9999	Primary	NA	Not Applicable			none	None
	Secondary						
	Tertiary						

Completed By:	Date:
HOWER, D	1/17/2003