

Containment Fan Cooler Motor Swap

Effective Date _____

QUALITY RELATED ENVIRONMENTALLY QUALIFIED

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1. SCOPE

- 1.1 This procedure provides instructions for swapping of Reactor Containment Fan Cooler Motors.

2. DISCUSSION

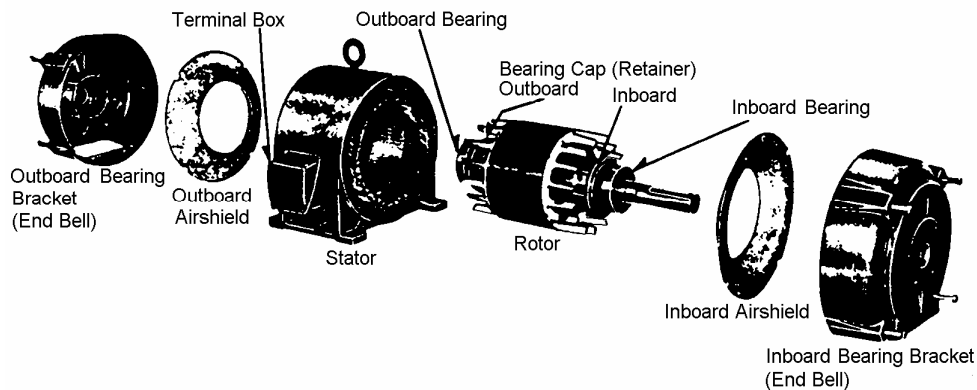


Figure 1: Typical Reactor Containment Fan Cooler Motor

- 2.1 Motor Cooling Coil inspection is performed to monitor degradation that may require coil replacement. Replacement cooling coil assemblies are not carried as a normal stock item. If indications show future replacement to be probable, procurement documents should be initiated.
- 2.2 Per AD7.DC9, "Maintenance Organization Procedure Use," steps may be performed out of the sequence presented in this procedure provided it is clearly obvious that it is technically and administratively acceptable to do so.

3. REFERENCES

- 3.1 Intranet "Electrical Equipment Lubrication Chart"
- 3.2 MP E-57.2B, "Wire and Cable Terminations"
- 3.3 MP M-56.23, "Coupling Inspection and Maintenance"
- 3.4 061808, Details 1-26 (Sheet 58) and 1-33 (Sheets 82 & 83)
- 3.5 663079-51, Westinghouse Technical Manual for the Reactor Containment Fan Cooler

4. ACCEPTANCE CRITERIA

- 4.1 Acceptance criteria is stated within the procedure.

5. PREREQUISITES

- 5.1 Ensure motor to be installed has been painted with Class 1 coatings.
- 5.2 Special Tools
 - 5.2.1 Thermogun and propane torch
 - 5.2.2 Vacuum cleaner
 - 5.2.3 Bearing puller
- 5.3 Measuring & Test Equipment
 - 5.3.1 Megger, 1000 VDC
 - 5.3.2 Long feeler gauges
 - 5.3.3 Clamp-on Ammeter

5.4 Materials

- 5.4.1 Bearing Lubricant, Westinghouse No. 773A773GXX (XX=container volume), or Chevron SRI (S/C 93-7086)
- 5.4.2 Permatex Sealant #2
- 5.4.3 Flowable sealant (RTV-734)
- 5.4.4 Bearings, two SKF 6318J/C3 or EM or equal
- 5.4.5 Raychem Kit No. NMCK-3-42A
- 5.4.6 Raychem Kit No. NMCK-3-42B
- 5.4.7 Raychem Kit No. NMCK-3-42F
- 5.4.8 Raychem Breakout No. 502A834-52/144 (S/C 93-1583)
- 5.4.9 Sheeting Silicon Rubber, 1/16" thick, 24" X 24" (S/C 72-9523)

6. **PRECAUTIONS AND LIMITATIONS**

- 6.1 Avoid excessive handling and bending of motor leads. Silicone impregnated fiberglass insulation is brittle and susceptible to cracking.
- 6.2 To prevent overheating, DO NOT run the motor for an extended period of time without CCW available and lined up to supply cooling to the motor. Momentary runs, such as "bumping for rotation," may be performed without CCW cooling to the motor.

7. INSTRUCTIONS

NOTE 1: Steps requiring documentation in Attachments are indicated by a √ in the left margin.

NOTE 2: Checkboxes "[]" are provided in the right-hand column as a place-keeping tool.

7.1 General Instructions

7.1.1 Throughout the performance of this procedure, document all circuit and configuration modifications on form 69-11636.

7.2 Preliminary Actions

7.2.1 Supervisor conduct tailboard to ensure the following:

- a. All involved personnel are aware of their responsibilities and work scope. []
- b. Mechanical maintenance is prepared to support the following activities: []
 - Coupling measurements
 - Coupling removal and installation
 - Rigging and transport of motor components
 - Alignment

7.2.2 Ensure motor has been removed from service AND cleared per OP2.ID1, "Clearances." []

7.3 Motor Removal

- 7.3.1 In the control room, remove motor temperature indications (inboard bearing, outboard bearing, and stator) from computer scan. []
 - √ 7.3.2 At the linestarter, measure As Found motor insulation resistance at 1000 VDC. Record in Table 2. []
- ACCEPTANCE CRITERIA:** >2 megohms
- 7.3.3 At the applicable motor thermocouple junction box, lift the outgoing PPC thermocouple leads from the terminal boards for the inboard bearing, outboard bearing, and stator hot spot thermocouples. []
 - 7.3.4 Disconnect the flex conduit (containing the outgoing PPC thermocouple leads) from the applicable thermocouple junction box AND support out of the way. []
 - 7.3.5 IF the existing motor bearing thermocouples are to be used on the motor being installed, THEN perform the following: [] []N/A
 - a. Lift leads from the thermocouples.
 - b. Disconnect flex conduit from the thermocouples.
 - c. Remove motor bearing thermocouples from bearing brackets (end bells).
 - d. Install FME covers on thermocouple passages in bearing brackets (end bells),
 - e. Ensure thermocouples are tagged for future identification.
 - f. Protect and store thermocouples in a safe place (i.e. motor "gang box") for re-use.
 - 7.3.6 Remove vibration switch (YS) AND secure out of the way. []

7.3.13	Visually inspect heat exchanger housing and coils for:	[]	
	<ul style="list-style-type: none"> • Coolant leakage • Chipping or cracking • Corrosion • Obstructions 		
	a. <u>IF</u> degradation is noted, <u>THEN</u> initiate an action request for future replacement.	[]	[] N/A
7.3.14	Install FME covers on heat exchanger and housing to protect from falling debris.	[]	
7.4	Motor Installation.		
7.4.1	Ensure motor to be installed has been painted with Class 1 coatings.	[]	
7.4.2	Coordinate with mechanical maintenance (rigger) to transport and rig replacement motor onto pedestal.	[]	
7.4.3	Ensure motor coupling hub is installed on new motor.	[]	
	a. <u>IF</u> necessary, <u>THEN</u> coordinate with mechanical maintenance for the following:	[]	[] N/A
	1. Installation of motor coupling hub.		
√	2. Ensure coupling fit data is recorded on the on Motor Coupling Data Sheet, Attachment 1.		
7.4.4	<u>IF</u> required, <u>THEN</u> fabricate new gasket between motor and heat exchanger using silicon rubber sheeting (S/C 72-9523).	[]	
	a. <u>IF</u> gap between end bell and baseplate is less than 1/16", <u>THEN</u> a flowable sealant (RTV - 734) may be used in lieu of a gasket (AT-MM A0607418).		
7.4.5	Install motor hold down bolts and ground straps.	[]	
	a. Document restoration of ground straps on form 69-11636.		
7.4.6	Coordinate with mechanical maintenance as needed to perform motor alignment.	[]	
	a. Ensure coupling spool piece is removed following completion of alignment.		

- 7.4.7 Following completion of alignment, inspect heat exchanger housing AND cooling coils to ensure that all tools, hardware, and debris have been removed prior to installation of covers. []
- 7.4.8 Install permanent heat exchanger covers. []
- 7.4.9 Exercise the disc shaped pressure equalizing valve on the side of the pedestal to verify it is operable and silicone "O-ring" is properly seated. []
- 7.4.10 IF re-using thermocouples removed in step 7.3.5c, OR IF new thermocouples are being installed, THEN perform the following: [] []N/A
 - a. Install bearing thermocouples into bearing brackets (end bells).
 - b. Connect flex conduit from thermocouple junction boxes to the associated thermocouples.
 - c. Land thermocouple leads.
- 7.4.11 Ensure bearing thermocouple leads are terminated to the correct terminal boards in the thermocouple junction boxes (i.e. inboard bearing thermocouple terminated to inboard bearing terminal board and outboard bearing to outboard terminal board). []

NOTE: Since these motors may be used in different CFCU configurations, the bearing that used to be the outboard bearing may now be the inboard bearing, and vice versa.

- 7.4.12 Ensure the thermocouple leads in the cross-over flex between the two thermocouple junction boxes are terminated as needed to complete the circuit between the affected bearing and stator thermocouples and the outgoing PPC thermocouple leads. []
- 7.4.13 Verify operability of bearing thermocouples. []
- 7.4.14 Install vibration switch (YS) removed in step 7.3.6. []
- 7.4.15 Temporarily terminate and insulate motor leads. []

NOTE: Newly installed motor must be bumped in low speed and then in high speed to verify rotation is correct PRIOR to final Raychem installation.

- 7.4.16 Verify motor coupling hub is secure AND ensure coupling guard is installed. []

NOTE: Motor is not yet coupled to CFCU at this point; the coupling spool piece is removed.

- 7.4.17 Ensure area around motor is clear AND secure the area with barricades as needed in preparation for motor rotation check. []

- 7.4.18 At the linestarter, measure insulation resistance at 1000 VDC. []

ACCEPTANCE CRITERIA: > 2 megohms.

- 7.4.19 Request temporary lift of clearance for testing. []

CAUTION: Since CCW cooling may not be available or lined up to the motor at this time, minimize the time the motor is run while "bumping" for rotation in the following steps.

- 7.4.20 Ensure proper direction of motor rotation as follows:
 - a. Request operations to "bump" motor in LOW speed AND check motor for proper direction of rotation. []

- 1. Allow rotor to come to a complete stop prior to continuing.

- b. After rotor comes to a complete stop, request operations to "bump" motor in HIGH speed AND check motor for proper direction of rotation. []

- c. Request operations re-hang the clearance AND prepare for final termination of motor leads. []

- 1. Verify clearance has been re-hung and is active prior to continuing. []

- d. IF direction of motor rotation was incorrect in either of the above rotation checks, THEN swap any two leads at the motor for the affected speed(s). [] [] N/A

- 7.4.21 Terminate and re-insulate motor power leads per MP E-57.2B. []
- a. Refer to 061808, Detail 1-33 (sheets 82 & 83) for information specific to CFC motor terminations. This drawing identifies termination "hardware" (lugs, nuts, bolts, washers, etc.).

NOTE: The drawing shows two termination configurations. The one labeled "DETAIL A" is the one used on all CFCU motors.

- b. Torque bolts per Table 1. []

Table 1: Torque Table		
Bolt Size	Torque (FT-LBS)	
	Lubricated (NO-0X-ID)	Non-Lubricated (Silicon Bronze)
1/4	5-3/4	5-3/4
5/16	10	15
3/8	14	20
7/16	--	30
1/2	25	40
5/8	40	55
3/4	60	70

- c. Refer to 061808, detail 1-26 (sheet 58) for information regarding selection of Raychem insulating materials.
- d. Document installation of Raychem insulating materials on form 69-20618, "Applied Electrical Insulation Record."

- 7.4.22 At the linestarter, measure insulation resistance at 1000 VDC. Record in Table 2. []

ACCEPTANCE CRITERIA: >2 megohms

- 7.4.23 Coordinate with mechanical maintenance for installation of coupling spool piece to couple motor to fan. []
- 7.4.24 Return bearing and stator temperatures to computer scan. []
- 7.4.25 Report off clearance for coupled test run. []
- 7.4.26 Coordinate as needed to accomplish calibration of vibration switch during coupled test run. []

7.5 Maintenance Verification Testing

- | | | | |
|-------|--|--|--------|
| 7.5.1 | Coordinate with operations and C&RP to run the motor in low speed. | [] | |
| √ | <ul style="list-style-type: none"> a. Note time when motor was started. b. Run motor until bearing and stator temperatures stabilize <u>AND</u> record the following in Table 3: <ul style="list-style-type: none"> • Run time • Running current • Bearing temperatures from plant computer c. Locate the Hot Spot thermocouple by measuring the temperature of each thermocouple terminal at the stator and selecting highest reading. d. <u>IF</u> necessary, <u>THEN</u> reconfigure thermocouple leads in the thermocouple junction boxes as needed to connect the Hot Spot thermocouple to the PPC. e. Check Hot Spot temperature at stator corresponds with temperature indicated at the PPC. | <p>[]</p> <p>[]</p> <p>[]</p> <p>[]</p> <p>[]</p> | []N/A |
| 7.5.2 | Coordinate with operations to run the motor in high speed. | [] | |
| √ | <ul style="list-style-type: none"> a. Note time when motor was shifted to high speed. b. Run motor until bearing and stator temperatures stabilize <u>AND</u> record the following in Table 3: <ul style="list-style-type: none"> • Run time • Running current • Bearing temperatures from plant computer • Stator temperatures from plant computer • Motor vibrations (coordinate with predictive maintenance) | [] | |
| 7.5.3 | Document As Left configuration of thermocouple junction boxes on form 69-11636. | [] | |
| | <ul style="list-style-type: none"> a. <u>IF</u> applicable, <u>THEN</u> submit an FCT to update plant drawings for As Left configuration of thermocouple junction boxes. | [] | []N/A |

7.6 Documentation and Notification

- √ 7.6.1 Record test equipment used.
- √ 7.6.2 Verify acceptance criteria met and documentation complete;
e.g., signoffs, data, and N/As have been entered as appropriate.
- 7.6.3 Update component database as needed. []

Motor Coupling Data Sheet

U1&2 Attachment 1: Page 1 of 1

WO# _____

7.4.3a.2 Coupling Fit Data

	<u>Assembled</u>	<u>Remarks</u>
Coupling Shaft O.D.	_____	_____
Coupling I.D.	_____	_____
Fit	_____	_____

Measuring & Test Equipment (Description)	ID Number	Calib Due Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Remarks: _____

Performed By: _____ Date: _____

Reviewed By: _____ Date: _____

Summary Sheet

U1&2 Attachment 2: Page 1 of 1

7.3.2 and 7.4.22 Motor Insulation Resistance Data

Table 2: Insulation Resistance Data		
As Found	As Left	Acceptance Criteria
_____ MΩ	_____ MΩ	≥2 MΩ

7.5.1b and 7.5.2b Low and High Speed Test Run Data

Table 3: Test Run Data									
SPEED	RUN TIME	AMPS	STATOR TEMP	BEARING TEMPS		MOTOR VIBRATIONS (IPS)			
				INBD	OTBD	INBOARD BEARING		OUTBOARD BEARING	AXIAL
Low									
High						Vert.	Horiz.	Vert.	Horiz.

7.6.1 Record test equipment used.

Measuring & Test Equipment (Description)	ID Number	Calib Due Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

7.6.2 Verify acceptance criteria met and documentation complete.

_____DV_____

Date: _____

Remarks: _____

Reviewed By: _____

Date: _____