A-100 50-348/364-CIVP 2/13/92 APC EX 100

SECTION IV
ROUTINE MAINTENANCE

SCHEDULED MAINTENANCE

There are two inspection periods which are important to the proper operation and maintenance of your Reliance motor. These occur every 3 months (or 500 operating hours — whichever comes first) and every six months, respectively. In addition, the following should always be observed.

- Provide adequate ventilation
- Keep air and exhaust openings clean and free of obstructions.
- Avoid sharp blows and excessive axial thrust loads on the output shaft (particularly on sleeve bearing motors).
- Maintain proper lubricant level (check weekly on oil-lubricated units).

Reliance Large Duty Master A-C Motors when properly applied, are very easy to maintain. Since clearances and fits are precisely machined, there are no periodic mechanical adjustments to make. Like any precision machine, periodic inspection and simple routine maintenance will prolong your motor's life and help spot potentially damaging conditions before they assume the proportions of a disaster. The minimal time spent performing the simple procedures below cannot begin to compare with the cost of lost productivity and time consuming major repairs incurred through neglect of routine inspection and maintenance.

PERIODIC INSPECTION

Every 3 months (or 500 operating hours, whichever comes first).

1. Listen for any abnormal noises and check cause immediately.
2. Check for excessive vibration.
3. Check to see that air filters, when used, are in place and clean, and that air passages are not blocked or clogged.
4. Check to see that all covers are in place and secure.
5. Check for proper lubrication.
6. Check bearing temperature rise.
7. Check voltage and frequency variations. Unbalanced voltage of single-phase operation of polyphase motors will cause excessive heating and ultimately failure. Only a slight unbalance of voltage applied to a polyphase motor will cause large unbalance currents and resultant overheating. Periodic checks of phase, voltage, frequency, and power consumption of an operating motor are recommended. These checks can also provide an excellent indication of the load from the driven equipment. Comparisons of this data with previous no-load and full load power demands will given an indication of the performance of the driven machine.

WARNING:

HIGH VOLTAGE. ELECTRIC SHOCK MAY CAUSE SERIOUS OR FATAL INJURY. DISCONNECT POWER BEFORE TOUCHING ANY INTERNAL PART. HIGH VOLTAGE MAY BE PRESENT EVEN WHEN THE MACHINE IS NOT ROTATING.

8. TURN OFF INPUT POWER and check to see that all electrical connections are tight.
9. Check for frayed points on interconnecting wiring, especially at points where it contacts the motor frame.

SEMI-ANNUAL MAINTENANCE

1. Inspect and clean rotor ends, windings and fan blades.
2. Check electrical connections for tightness and absence of corrosion.

BEARING LUBRICATION

Depending upon the application and ratings, your motor is equipped with either anti-friction or sleeve type bearings. When properly cared for (i.e., inspection and lubrication) bearings will provide years of uninterrupted service. Use one of the following lubrication procedures, depending on the type of bearings with which your motor is equipped.

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Anti-Friction Bearings (Grease Lubricated)

Lubrication should be carried out on schedules outlined on the unit nameplate. If nameplate data is not available, use the following:

SPEED rpm.	SERVICE CONDITIONS*		
	Standard (Hrs.)	Severe (Hrs.)	Extreme (Hrs.)
1800 1200	4000	2000	1000
900 600	6000	3000	1500
3600	2000	500	350

Standard Conditions
Normal or light loading, clean 0° F *(-18° C)* to 104° F *(40° C)* ambient air temperature.

Severe Conditions
Medium shock, vibration dirt dust, -20° F *(-30° C)* to 120° F *(50° C)* ambient air temperature.

Extreme Conditions
Heavy shock, vibration greater than .44 in/sec., heavy dust, dirt, abrasives, corrosives and/or extreme ambient air temperatures.
Low: -65° F *(-54° C)* to 0° F *(-18° C)*
High: +120° F *(50° C)* and higher

Recommended Lubricant
Chevron SRI No. 2 - Standard Oil of California, or equivalent.

CAUTION: Some greases are not chemically compatible and should be checked with Reliance sales office.

Lubricate anti-friction bearings in accordance with the following procedure:

1. De-energize the motor, preferably by opening manual disconnect switches.
2. Remove relief plug. If grease is caked around the plug, clean with a wooden stick or suitable tool. If severe caking appears at the plug, run the motor until the bearing housing is warm, permitting a freer flow of grease through the housing.
3. Add grease with a low pressure grease gun — a hand operated gun is recommended.
4. Add grease slowly until fresh grease appears around the shaft or grease relief. Then start the motor and run with the relief plug open for several minutes until all excess grease is relieved.
5. Replace plugs and wipe off any excess grease.

Sleeve Bearings

Oil should be changed periodically (at least 6 months), or immediately if discolored or contaminated. Follow the schedule on the motor nameplate, or if not shown, use the following schedule:

LUBRICATION SCHEDULE

SPEED rpm.	SERVICE CONDITIONS*	CHANGE OIL
3600	Standard Severe	Every 6 mos. 2000 Hrs.
1800 & Lower	Standard Severe	Every 6 mos 2000 Hrs.

TABLE V.

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NUCLEAR REGULATORY COMMISSION

Docket No. 50-348/364 Official Exh. No. APC #100

In the matter of

Staff IDENTIFIED 2/13/92

Applicant ✓ RECEIVED 2/13/92

Intervenor REJECTED

Cont'g Off'r

Contractor DATE

Other Witness

Reporter L Estep

Service Conditions:

Standard Conditions:
Normal or light loading, clean 0° F *(-18° C)* to 104° F *(40° C)* ambient air temperature.

Severe Conditions
Medium shock, vibration, dirt dust, -20° F *(-30° C)* to 120° F *(50° C)* ambient air temperature.

Lubricating oils for sleeve bearing motors should be selected as follows:

1. Viscosity in SUS *(centistokes)* @ 100° F: *(37.8° C)*:

Ambient Temperature Range	Speed	
	600 RPM or Less	Over 600 RPM
0° F to 120° F *(-18° C** to 50° C*)*	300 SUS *(68 cSt)*	150 SUS *(32 cSt)*
-20° F to 50° F *(-30° C** to 10° C)*	150 SUS *(32 cSt)*	90 SUS *(18 cSt)*

TABLE VI.

* For higher temperatures, oil coolers should be used.
** For lower temperatures, heaters should be used to assure adequately high starting temperature.

2. Pour Point: Below minimum starting temperature.
3. Quality: Use a good grade turbine type oil, rust, foam, and oxidation inhibited. Avoid automotive oils or additives other than those specifically recommended by the oil manufacturer.

The procedure for changing oil is as follows:

1. De-energize the motor, preferably by opening the manual disconnect switches.
2. Remove drain plug and drain oil.
3. If oil appears to be contaminated, the housing can be flushed out by filling with fresh oil and draining again.
4. Replace plug and fill through filler cap until oil level indicated on oil sight gauge
5. Tighten caps and plugs, fill constant level oiler if provided.
6. Start unit and observe to be assured of no oil leakage.

Winding Maintenance
De-energize motor preferably by opening manual disconnect. To inspect the ends and outside surface of the windings, remove the endcover from the motor. Inspection of these portions of the windings will provide a good indication of their general condition. To thoroughly inspect and clean the windings it may be necessary to remove the rotor.

There are numerous methods for cleaning windings. The following methods are most commonly used, in order of preference. NOTE: Before cleaning the windings, check for loose blocking, evidence of damage to insulation, distortion or movement of coils, etc. If any of these conditions exist, contact your local Reliance Electric service engineer for recommendations.

Dry Wiping
This method is satisfactory when the surfaces to be cleaned are accessible and when only dry dirt is to be removed. Use a clean dry, lintless cloth. Do not use "waste" since the lint will adhere to the insulation and increase dirt collection. Lint is particularly objectionable on high voltage insulation systems as it tends to concentrate corona discharge.

Brushing and Suction Cleaning
Remove the dry dust and dirt by brushing with a bristle brush, followed by a vacuum suction cleaning. DO NOT USE WIRE BRUSHES.

Blowing
Dry dirt and dust can be removed from inaccessible crevices by using a jet of low pressure compressed air.

CAUTION: Do not use air pressures greater than 30 psi (200 kPa). Avoid directing the air in such a way that the dirt will be blown into inner crevices.

1. Avoid inhaling fumes
2. Protect eyes
3. Protect skin
4. Avoid flamible solvents

Solvent Cleaning

CAUTION: Do not use solvents to clean windings with Class H (silicone) insulation (See nameplate for type of insulation). Refer to "Cleaning With Water and Detergents" for proper method of cleaning silicone insulation.

Oil, grease, tar and wax can be removed by cloth wetted with solvent, followed by wiping with a dry cloth. Typical solvents which can be used are:

- Atlantic Safety Solvent
- Graymills Solvent
- De-Greaseall
- Zep
- Stoddard Solvent

WARNING
BE SURE TO ADHERE TO THE SOLVENT MANUFACTURER'S PRECAUTIONS.

Cleaning with Water and Detergent
Windings can be cleaned by hose washing or by a pressure spray from a low pressure steam generator or shop steam line.

CAUTION: Jet pressure and temperature should not exceed 30 psi (200 kPa) and 90° C respectively. Oil, grease, tar and wax can be removed by adding a NON-CONDUCTIVE DETERGENT to the wash water. After washing, it is advisable to dry the windings in an oven.

Reconditioning (Revarnishing) Windings
If after cleaning with solvent or water and detergent, the insulation shows signs of dryness, etc., it may be necessary to revarnish the windings. Consult your local Reliance service engineer for type and proper method of revarnishing.

Checking Insulation Resistance
If the motor has been in storage for an extensive period or has been subjected to adverse moisture conditions, check the insulation resistance of the stator winding with a megger or an insulation resistance meter. The minimum insulation resistance (Rm) can be determined from the following formula:

$$Rm = Kv + 1$$

Where

Rm = Minimum insulation resistance in megohms at 40° C of the entire machine winding.

KV = Rated machine potential, in kilovolts.

For machines in good condition, insulation and resistance readings of 10 to 100 times Rm are not uncommon. If the insulation resistance is lower than that calculated from the formula, the winding should be dried out in one of these two ways:

1. Bake in an oven (preferably a circulating air oven) at a temperature not over 90° C until insulation resistance remains constant.
2. With the rotor locked, apply low voltage and gradually increase current through winding (do not exceed 50% full load amps) until winding temperature, measured with thermometer, reaches 90° C. Do not exceed this temperature.

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