

Maintenance Guidelines for Electrical Motors

Electric motors are typically simple and reliable, making it possible to overlook regular maintenance practices that can help reduce the risk of equipment breakdowns. A preventative and predictive maintenance program for electric motors can help reduce the risk of motor failures that can result in unscheduled outages and critical business interruptions. These practices can help identify current material conditions, predict motor life expectancy and aid in future maintenance planning for ancillary equipment.

Recommended Protective Devices and Features

- A means to electrically disengage the motor, such as a manual disconnect switch or manually operable circuit breaker.
- Short circuit and ground fault protection in the form of current limiting fuses or circuit breaker. The breaker settings or fuse ratings should be determined by applicable electrical codes.
- Overload protection, which protects against thermal damage to the windings from operating with excessive load.
- Locked rotor protection. A locked rotor relay can help prevent damage to the windings if the electric motor fails to start or accelerates too slowly due to a locked rotor condition. A locked rotor condition can occur if something is obstructing the free rotation of the motor or driven object. An unprotected locked rotor condition can result in an extreme overcurrent condition that could cause winding damage.
- Overspeed protection for separately excited and shunt-wound DC motors. This is usually a field undercurrent relay.

Preventive and Predictive Maintenance Guidelines

Establishing a formal preventive and predictive maintenance program can help identify potential problems and reduce the risk of equipment breakdowns.

The following practices should be included in your maintenance program. Only a qualified operator or technician should perform these tasks. For further guidance, consult the original equipment manufacturer. The frequency at which these maintenance activities are conducted may depend on conditions such as the environment, the working load, age and the criticality of the equipment.

- Visual inspections should include, but are not limited to:
 - > Motor housing, base plates, foundation and mounting bolts to verify the motor is secured in place.
 - > Moving and stationary parts for abnormal conditions, such as wear, dirt, debris and improper lubrication.
 - > The surrounding area to ensure it is free of dirt and debris. Rough environments may result in the motor becoming dirty and corroded.
 - > Motor temperature. Increased temperature while under normal operating conditions may indicate internal issues or improper cooling. Additional ventilation may be needed if a motor is located in an area where heat generated from normal operation cannot dissipate effectively.
 - > While the motor is running, listen for sounds, such as grinding, high pitch noises, or excessive vibrations, that could indicate there are internal problems.
 - > Check for acrid odor that might be emanating from the motor windings, which may indicate an overheating condition.
- Grease and lubricate bearings and other moving parts according to the manufacturer's guidelines.
- For motors that are critical for continued operations, the following should be implemented:
 - > A vibration monitoring and analysis program with a method for recording and trending results.

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- > Periodic motor alignment measurement. Inspect the connection point between the motor and the driven object for unusual wear and proper lubrication.
- > Annual electrical power equipment inspection and cleaning, including drive circuitry supplying power to motors.
- > An electrical testing program, with a method for recording and trending results, that includes:
 - Annual insulation resistance checks.
 - Annual thermographic inspections on motor controller and related switchgear
 - Testing applicable safety devices, including performing calibration checks on drive circuitry as recommended by the manufacturer
- Additional maintenance for DC motors should include:
 - > Annual internal cleaning and visual inspection to remove carbon buildup and foreign debris.
 - > Inspecting brush length and condition according to the manufacturer's instruction.

Contingency Planning

Some motors can have limited market availability, which can result in long replacement times and business interruptions due to loss of use. Characteristics such as voltage, frequency and horsepower ratings, frame size, mounting plate configuration and shaft dimensions are critical variables to consider when searching for suitable replacements.

Identify the electric motors that are critical to your operations and establish a contingency plan to help reduce the risk of costly business interruptions. The following elements should be included in your contingency plan:

- Availability of direct replacement motors and lead time for acquiring them
- Contractors required for motor replacement
- Critical spare equipment kept on site
- Rental options
- Expected time and procedures to restore service in the event of a failure



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