

MONITORING OF INDUCTION MOTORS

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Induction motors are the most popular prime mover for rotating equipment because they are highly reliable, efficient, and simple. There are many factors that cause motors to fail. For long-term reliability and good performance, failure factors should be understood, monitored, and maintained. It is important to understand the benefits proper motor protection and the risks faced if the motor is not properly protected. The first task is to decide what needs to be monitored. The second is to select appropriate machine-protection devices, identify proper settings, and take action based on the monitored results. Induction motors have certain absolute limits that must be monitored and controlled.

The critical components of an induction motor that need to be monitored include:

- 1) voltage and current;
- 2) stator windings insulation integrity;
- 3) vibration of the bearings and motor enclosure;
- 4) temperature of the winding, bearings, and cooling media;
- 5) speed;
- 6) pressure of the cooling media.

Motor voltage can be measured between the stator phases or between a phase and ground. A high-voltage terminal box makes it easier to visualize the three phases.

Connection diagram documentation is required. At times, U, V, W, and so may be used per International Electrotechnical Commission (IEC). This IEC standard establishes the direction of rotation. The integrity of the stator winding insulation is measured both offline and online. Offline tests include megohm measurements, high-potential tests, surge tests, and partial discharge test. High-potential and surge tests are not used for continuous monitoring. Vibration is measured on the motor housing and/or rotor shaft, depending on motor design. In motors with antifriction bearings, the supporting bearing housing follows the rotor motion because the bearing stiffness is greater. Thermocouples are constructed of two dissimilar metals that are welded together. When the temperature changes, a millivolt signal is generated and fed to an instrument that amplifies the signal and uses it to control the system. Two major types are used: the open-ended type or the type encased in a steel tube. There is nonspecific limit on motor speed variation, but there are limits on the maximum frequency variation from the power supply, which will be proportional to speed, this may carry a time limit.

The list of parameters is by no means complete. Any other parameters to be measured will depend on the end user, and monitoring methods and degree can vary significantly.

Literature:

1. Rajendra Mistry, William R. Finley Rotating machines. The pros and cons of monitoring devices//IEEE Industry Applications November/December 2018, Vol.24, No.6, pp. 44-55.