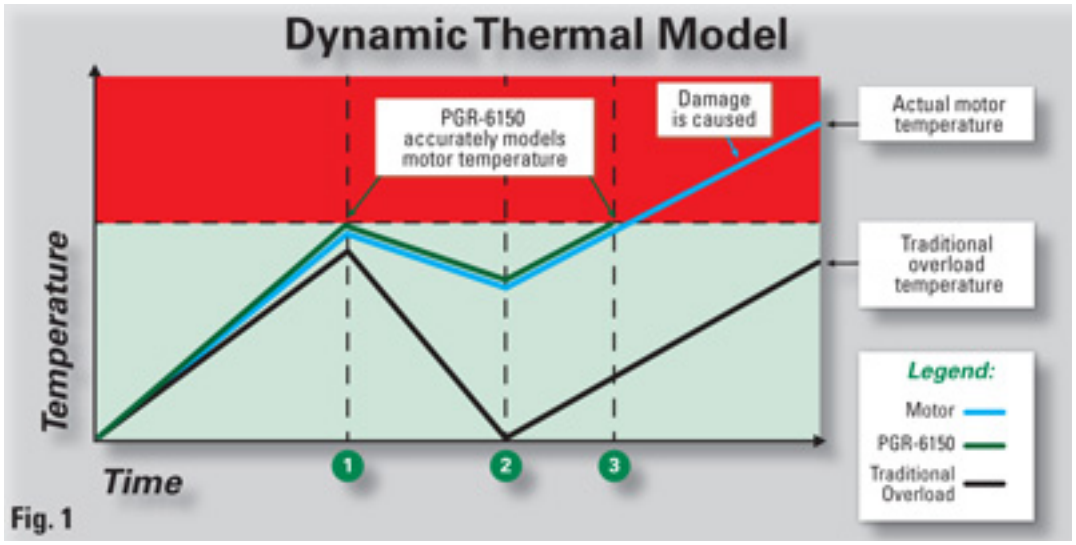

Fig. 1

Problem

A thermal-based motor overload relay may allow a restart on a hot motor prematurely because a bimetallic overload relay cools faster than the motor it is protecting. Once the relay resets, an operator can restart the motor, potentially causing costly equipment damage. The National Electrical Manufacturers Association (NEMA) reports that for every 8-10 degrees a motor is operated above its manufacturer's recommended maximum operating temperature, motor life is cut by half. To preserve the investment in a motor and avoid downtime and replacement labor, an accurate measurement of motor temperature is essential.

The elements of a traditional bimetallic overload clearly have less mass than a motor and can be expected to cool faster. Manufacturers take this into account when designing these devices, which generally do a reasonably good job of emulating the condition of the motor (assuming they are installed in the same ambient temperature environment as the motor). However, the sensitivity of the traditional overload device cannot adjust dynamically to respond to overloads and time; consequently, it cannot provide an accurate temperature model in all situations. Also, each time a bimetallic overload trips, its setpoint shifts slightly. After a number of trips, it will drift out of calibration.

Solution

Electronic motor protection relays that use dynamic thermal modeling (Fig. 1) to accurately predict motor temperature are available. By tracking the motor current and the amount of thermal capacity used (I2t), an electronic relay can accurately calculate the temperature of the motor under all operating conditions. The relay also looks at the input of the temperature sensors in case there is a heat problem unrelated to current, such as high ambient temperature or blocked motor ventilation. This approach has proven to be more reliable than depending on the input of winding temperature sensors alone.

The Littelfuse PGR-6150 Motor Protection Relay has sophisticated thermal modeling that can accurately protect the motor from overheating, monitor trends in motor conditions to provide a warning before damage occurs and notify the operator when it is safe to restart the motor.

This relay also detects many other problems, such as jams, phase unbalance and overloads, and displays alarms that aid in troubleshooting. Other motor protection relays, such as the Littelfuse PGR-6100, detect ground faults and monitor motor-winding resistance for worn or melted insulation. If the windings are damaged, this kind of relay keeps a motor from starting, thus preventing damage to the unit. It can also reduce the risk of electrical shock and arc flash, because the windings are prevented from degrading and causing a short circuit condition.

Return On Investment

NEMA identifies overheating as the leading cause of motor failure. It is not uncommon for operators to restart a hot motor without understanding and correcting the cause of an overload condition, leading to additional heat and damage. Fortunately, modern protection relays can assist with troubleshooting and prevent motor damage.

Electronic relays are easy to justify, and many maintenance managers see the value of upgrading their old-fashioned thermal overloads. The cost of electronic motor protection relays has decreased, and at the same time their features have increased, making them more attractive for protection of smaller, lower-horsepower units.

For more information on motor protection relays, please visit www.littelfuse.com/protectionrelays .

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