Down The Line

How Norfolk Southern Railway Company Keeps Traction Motors at Peak Performance

Over the past year, Norfolk Southern Railway Company's Mechanical Department in Altoona, PA, has changed the way it looks at its 3-ton, 750 hp motors that keep its locomotives in motion. With a fleet of more than 18,000 traction motors, keeping them all from failure is no easy job. But Tom Gardner, Electrical Engineer for Norfolk Southern, definitely sees an improvement in motor reliability thanks to a customized Motor Circuit Evaluator (MCETM) system from PdMA Corporation.

"Every locomotive is inspected every 3 months," says Gardner. "When a motor comes to us, its because a problem is suspected. Its our job to examine it, fix it, and put it back on the line as quickly as possible." The department currently receives about 12 traction motors each day for testing, 4 or 5 of which fail.

Previously, Norfolk Southern experienced repeat short-time failures, where a motor would be repaired, only to come back to the shop in less than a year. "Last year, we had about 70 repeats out of 1,800 motors." Although that may not sound like a lot, Gardner says, Its bad for us. We don't like to have any. In addition, Gardner describes these short-time failures as very costly.

Before acquiring the MCE system, the primary tools for traction motor testing were meghometers and DC hi-pot, which can be very dangerous because of the exposure to DC voltage. "With the hi-pot, workmen have to use special rubber gloves, and sometimes they would still get a shock, so from a safety standpoint, using the MCE is a lot safer," said Gardner. In addition, the MCE system allows Norfolk Southern to test parameters that they previously could not. "The problem with these traction motors is that we had no way of measuring the actual resistance of the winding," says Gardner. "We needed to measure resistances in the ten thousandths of an ohm range and less. We needed to measure 0.005 ohms and had no measuring device that could go that low. The meghometers and hi-pots weren't giving us the information we needed. We were letting motors pass that should have been serviced."

To solve the problem, Norfolk Southern enlisted the help of PdMA Corporation of Tampa, FL. PdMA supplied Norfolk Southern with MCE Motor Testers and eventually with custom software to meet their specific motor applications. Now the MCE is Norfolk Southern's primary testing device for traction motors, and, according to Gardner, since the MCE was introduced, short-time failures have decreased by 40 percent.

"Once we had the MCEs, we needed to set some parameters to determine pass/fail criteria, since there weren't any real guidelines for traction motors," says Gardner. After collecting and evaluating data from motors sent to the shop for three months, Gardner set up parameters and a set of values to check MCE readings against (see graph). "I gave a copy of these guidelines to the guys in the shop so they could quickly see if a motor needs a complete overhaul or simply a repair."

The MCE Motor Tester collects and trends data such as resistance to ground, capacitance to ground, phase resistance and phase inductance. Gardner's shop is still evaluating the pass/fail criteria of motor winding inductance. "We're still in a learning curve on the use of the inductance parameter," says Gardner. "It is not a parameter that we fail a motor on right now."

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When a motor comes into Norfolk Southern's Mechanical Department, its tested immediately with the MCE, and then its cleaned. Depending on the test results, the motor is either sent to Run and Repair or to Restore for a complete overhaul. Its then tested again to see if the values have changed from its initial test. When a motor achieves a pass from Run and Repair or Restore, it is sent to Final Testing, where its tested several more times.

"I've seen a motor go to ground just riding on a cart across the plant!" says Gardner, explaining how critical it is to test and retest a motor.

Norfolk Southern has 6 stationary MCE testers in use at its shops. About 15 technicians use the equipment, which is tied to a LAN server. PdMA created a customized software database specifically for Norfolk Southern according to their needs and specifications. "The software is extremely user-friendly," says Gardner. "It always asks, Are you sure you want to do that? It won't allow you to make a mistake."

The result of Norfolk Southern's efforts is beginning to pay off, notes Gardner. In addition to the 40 percent decrease in repeat short-term failures, Gardner sees the MCE as helping Norfolk Southern to keep its locomotives on track. "The database information is just beginning to accumulate where we can really see the improvements in statistical terms. But I know, for every motor we keep from failing underneath a locomotive, we've saved the company at least $10,000," says Gardner.

And, the number of locomotives that Gardner and his team have to keep running will soon be rising. As a result of mergers, Norfolk Southern Corporation will soon direct more motors to the Altoona shop for testing and repair ---- approximately 30 more motors a day, according to Gardner. The number of MCE testing devices may soon also be on the rise. "We are looking at possibly adding a couple more MCE units next year," says Gardner. "I've already been talking with the company about it." In addition, Norfolk Southern takes in-source motors from New Jersey Transit, MetroNorth, and even the Egyptian National Railroad.

Norfolk Southern Railway Company's roots go back to the early days of railroading in North America. Currently, the railroads lines extend over 21,600 miles of road in 22 states, the District of Columbia, and the Province of Ontario, Canada. Norfolk Southern Corporation, based in Virginia, is the holding company for Norfolk Southern Railway Company.

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