CASE STUDY

ALABAMA MOTOR SHOP PREVENTS POTENTIAL CATASTROPHIC DC MOTOR FAILURE USING PdMA BAR-TO-BAR TESTER

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ABSTRACT

This case study demonstrates the importance of using advanced technologies for testing critical motor components. During a routine dc motor recondition, an Alabama motor shop using the PdMA MCE™ bar-to-bar tester potentially saved a southern paper mill hundreds of thousands of dollars in unexpected motor repair cost and unscheduled downtime. An armature with suspect high-riser connections passed the shop's old bar-to-bar testing method, but problems in the armature winding were clearly identified with the MCE bar-to-bar tester. This case study shows how the motor shop's reliance on first-rate test equipment and testing procedures proves beneficial and profitable to its customers.

700 HP DC MOTOR

THE DC MOTOR DATA

GE - 700 HP - 500 volt - 6 poles

ARMATURE WITH HIGH-RISERS

PROBLEM IDENTIFIED

During bar-to-bar testing the armature winding revealed varying resistance measurements that were considered suspect by the repair technician. Although the shop's conventional bar-to-bar tester did not indicate a problem with the armature, the MCE bar-to-bar tester revealed varying high resistance conditions in the armature. After discussing the test data and suspect condition with the customer the decision was made to remove the old armature winding and isolate the problem. While stripping the armature the high-risers came out of the bars - pointing to the reason for the high-resistance readings. The loose risers were most probably causing brush sparking and unacceptable commutator wear.

FAILED HIGH-RISERS

BAR-TO-BAR TESTING CONSIDERATIONS

Armature bar-to-bar testing is relatively easy to do in the field and in the motor repair shop. The MCE bar-to-bar tester provides technicians with precision measurements. MCE bar-to-bar test data is captured, stored digitally on a computer, and graphed for analysis. The test data can be easily saved in a spreadsheet format for precise data analysis. MCE testing procedures must be understood and carefully followed to ensure test accuracy. Before performing bar-to-bar armature testing one should know if the armature is lap wound or wave wound, the number of poles in the motor, the number of commutator bars, and whether or not the armature is wound with equalizers. With this information, bar-to-bar testing may be expedited using an alternate method of spanned bar measurements greatly reducing the time to perform commutator bar-to-bar testing.

CASE STUDY ARMATURE DATA

Poles	6
Bars	126
Connection	1 & 2

Number of equalizers

Number of bars per pole = Bars/Poles
126 bars/6 poles = 21 bars
Bar Pole Pitch = 1 & 22

NOTE: Number of poles can't be determined based on nameplate speed.

RULE: When performing bar-to-bar testing using the spanned bars method, the span should be less than one pole-pitch. The fewer number of bars spanned the more accurate the results.

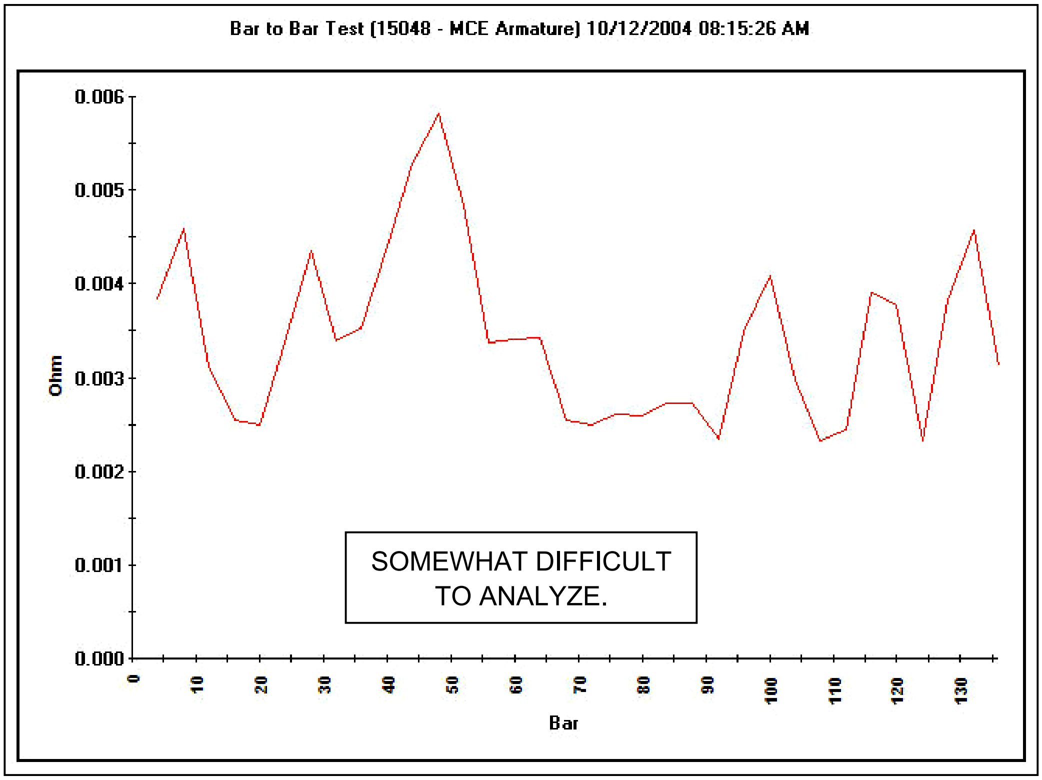
SPANNED BAR TEST METHOD

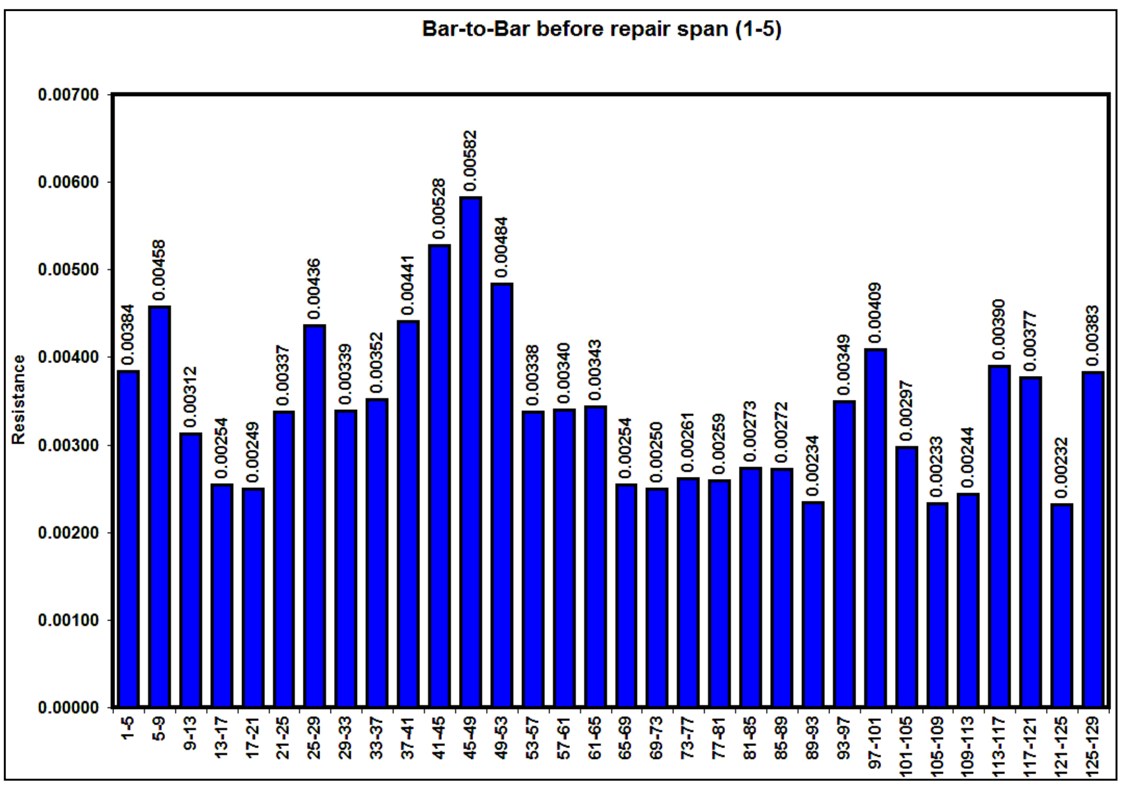
The MCE unit can be set up to perform either bar-to-bar testing or an alternate method may be used to test a "span of bars." When using the spanned bars method it is important to note the acceptable deviation between individual spans is much less than when using the bar-to-bar method. Where a deviation of 5% between bar-to-bar values is generally acceptable, a deviation of just 1% in spanned bar tests compared to the other test samples might indicate a problem in the armature. When an unacceptable deviation is realized using the spanned bars test method bar-to-bar testing on the suspect span should be performed to isolate the bar or bars where the suspect condition exists.

SUGGESTION

When using the spanned bars method- span no more than ¼ of bar pole pitch.

CASE STUDY TEST DATA – BAR-TO-BAR (BEFORE REWIND)



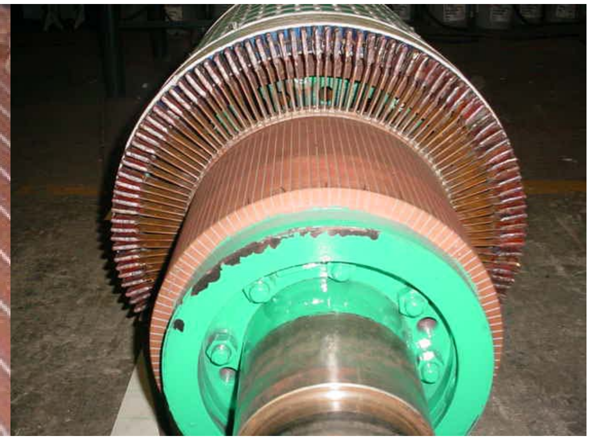


CONVERT MCE RAW DATA TO EXCEL BAR CHART

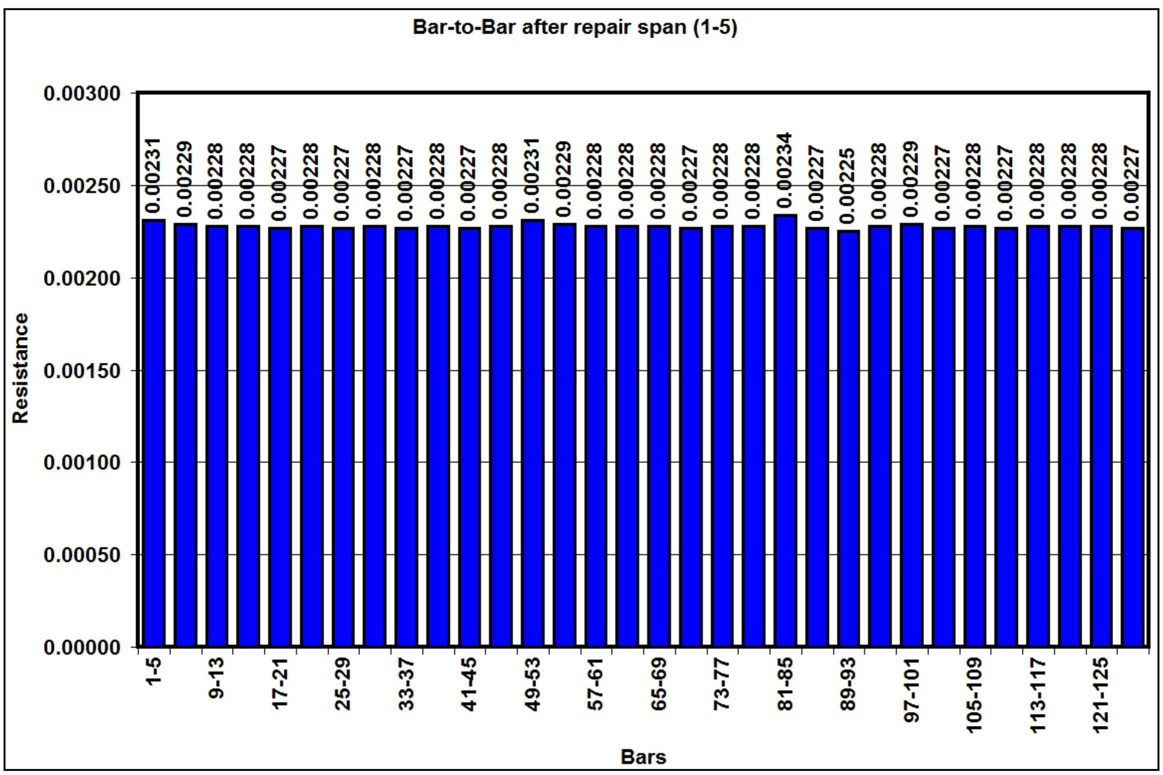
REPAIR PROCEDURE

After stripping the armature and cleaning the commutator, testing was performed on the commutator to ensure its suitability for rewind. The commutator was tested for grounds, shorts between bars, and commutator bar stability. The commutator was proven acceptable for rewinding and new risers were installed. New armature coils were made, inserted, connected, tested, and VPI treated. The images below show the commutator less the failed risers and the completed armature rewind.

COMMUATOR LESS FAILED RISERS



COMPLETED ARMATURE REWIND



MCE BAR-TO-BAR DATA (AFTER REWINDING ARMATURE)

CONCLUSION

While finding and resolving this motor problem is a great success, the real story of this case study points out the importance for motor repair shops and field service technicians to use proven tools and advanced technology to ensure first-rate motor repairs and reliability.

If missed during the repair process, the armature might have experienced a catastrophic failure due to flying parts (high-risers) damaging the armature and field windings, as well as destroying the commutator and other internal motor parts.

HELPFUL HINTS FOR MCE BAR-TO-BAR TESTING

1. Caution when using spanned bars option.
2. Span bars ½ pole pitch or less, prefer ¼ pole pitch.
3. Dump MCE raw data to Microsoft Excel- perform calculations of unbalance.
4. Convert raw data to Microsoft Excel bar chart.
5. Perform bar-to-bar testing on suspect spanned bars.

IMPORTANT
Use all tools and technologies available to you.

MCE bar-to-bar tester identified the problem in this armature while the motor shop's conventional bar-to-bar tester did not.

END