



# CASE STUDY—ROTOR

## EMAX diagnoses broken rotor bars in 2 pole motor

Industry:	Electric Utility	Fault Zone:	Rotor
Motor Type:	AC Induction	Voltage:	4160
HP:	3500	Speed:	3590 rpm

### Problem

Florida Power & Light Company (FPL) is an electric utility company based in Juno Beach, Florida. During routine EMAX testing in June 2003, Motor Engineer Enrique Rodriguez observed that the peak level of the pole pass sideband was 0.7419, which exceeded the alarm set point of 0.3 (Figure 1). Rotor bar problems were suspected, however, when vibration analysis was performed the results indicated a healthy motor. Due to the conflicting indications between the EMAX and vibration tests, the decision was made to monitor the motor and trend the test results.

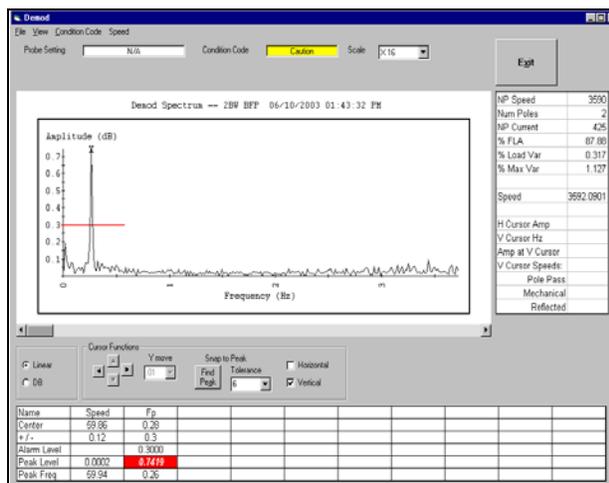


Figure 1

### Action Taken

The motor was retested periodically until 5/12/2004, at that time it was removed from service. The trended data indicated a 1420% increase in the peak level of the pole pass sideband from 0.1814 at a running speed of 3591 on 8/15/2001 to 2.5851 at a running speed of 3592 on 5/12/2004 (Figure 2).

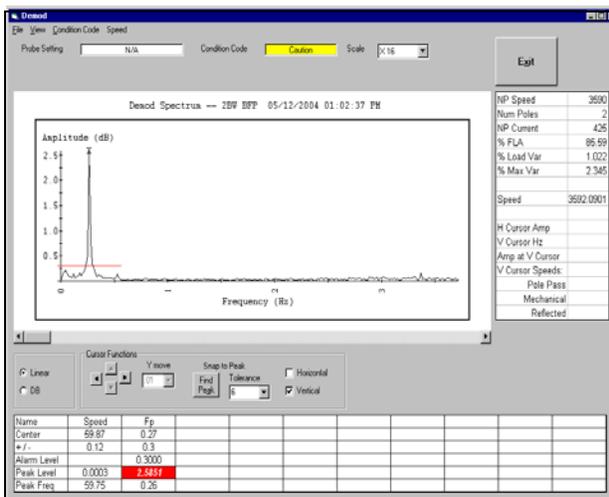


Figure 2

Trending the data from tests taken between 2001 and 2004 showed an exponential increase in the pole pass peak levels, which is typically indicative of at least one or more broken rotor bars.

Additionally, there was a 275% increase in the load variation, from 0.855% in 2001 to 2.345% on 5/12/2004 (Figure 2). The load variation should be constant from test to test under normal operating and motor conditions.

The Current Spectrum (Figure 3) of test data taken on 5/12/2004 showed an increase in sideband activity around the fundamental frequency, which also indicated broken rotor bars.

All EMAX test results indicated broken rotor bars in the motor. The motor was pulled and a RIC test was performed, which also indicated a rotor anomaly (Figure 4). The motor was sent to the motor shop, where it was disassembled. A visual inspection found 22 of 51 rotor bars were broken or cracked (See Figure 5).

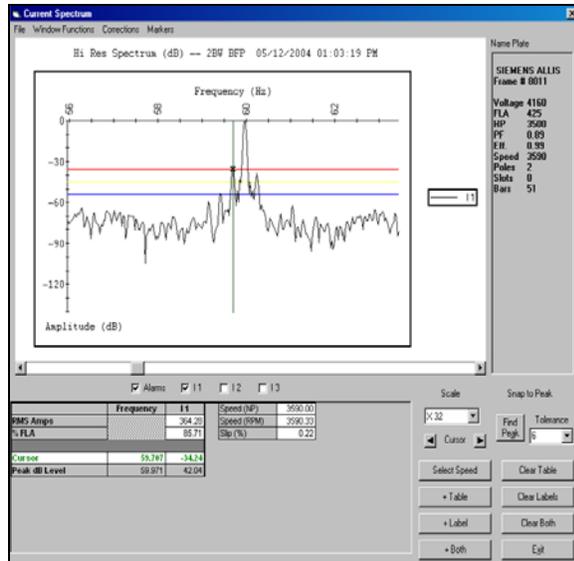


Figure 3

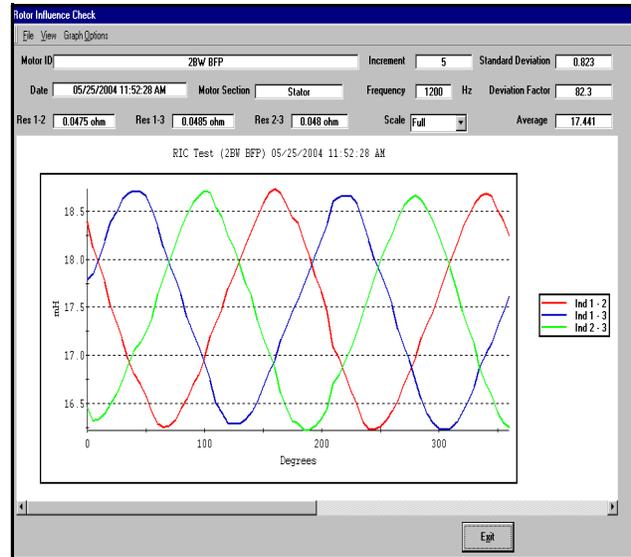


Figure 4

## Root Cause

It was determined that bad braze joints between the bars and end rings from a rotor repair performed in 2001 caused the broken and cracked rotor bars.

## Savings

A catastrophic failure of this motor would have resulted in a more expensive repair and the high costs associated with an unplanned outage. The progressive approach taken by FP&L utilizing predictive technologies resulted in substantial savings.

## Follow-up

Enrique has continued to use this testing approach on all the Boiler Feed Pump (BFP) motors in the Florida Power & Light system, with very good success. Every year motors with potential rotor issues are identified after running the PdMA EMAX Motor Current Signature Analysis testing, thus avoiding costly down time.

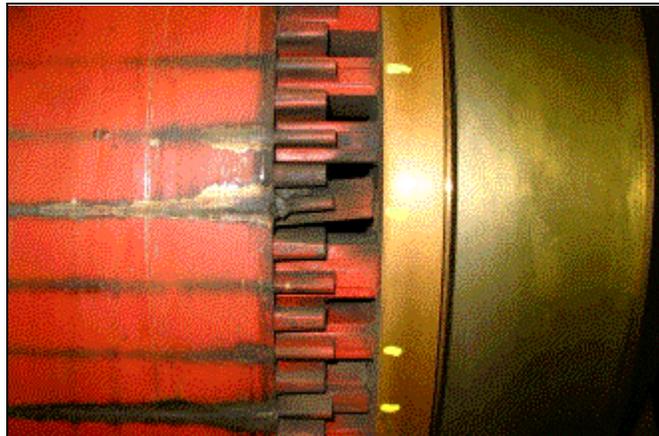


Figure 5