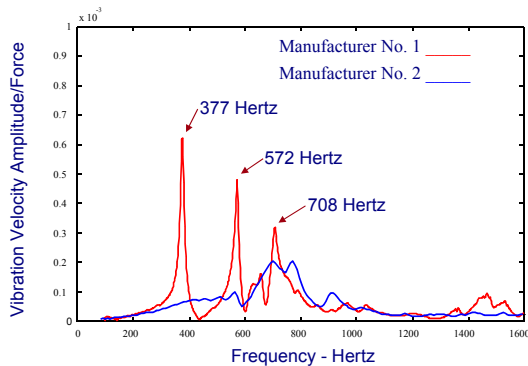


Locomotive Traction Motors

Vibration Based Condition Assessment

Problem: Railroad locomotive traction motors were unjustifiably failing vibration condition tests causing unnecessary tear-downs to be performed.

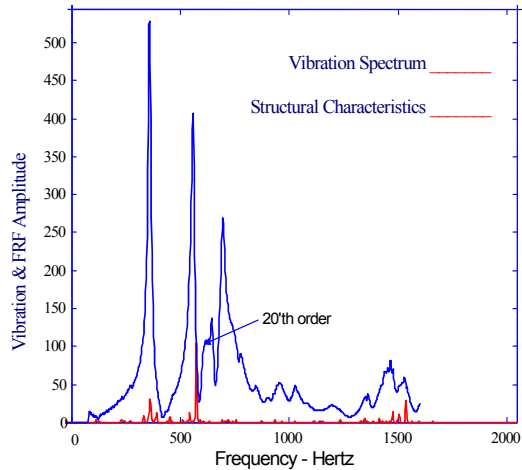
Vibration tests had been used successfully for many years to assess the condition of locomotive traction motors in a rebuild shop of a major national railroad. When the shop began processing traction motors built by a different manufacturer, the existing vibration test method was unreliable. Vibration measurements varied dramatically between identical tests performed on the same motor. Many motors that failed the vibration test were found to be in good condition when torn down, and motors that had just been rebuilt sometimes did not pass the vibration test.



Structural Frequency Response Functions Measured on Bearing Housings of Traction Motors from Two Different Manufacturers

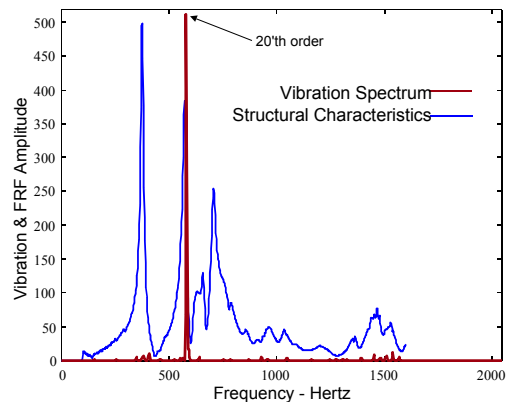
Frequency response function measurements on the bearing housings of the two different models of traction motor revealed the problem motor had three very lightly damped resonances. This was attributed to the housing material being steel rather than the cast iron construction of the other. Vibration spectrums measured during the standard shop vibration based condition assessment test revealed two important facts; 1) the motor speed drifts during the test and 2) the vi-

Solution: The vibration test procedure was modified to measure at locations which were not affected by bearing housing resonances. Advanced vibration diagnostic methods utilizing both low frequency spectral criteria and demodulated high frequency measurements were proposed in conjunction with a process for determining vibration limit criteria.



Vibration Spectrum @ 1780 RPM Superimposed on Structural Response Characteristics

bration frequency, the 20th harmonic of rotation speed, passes through a bearing housing resonance as motor speed changes. Vibration tests conducted when motor speed coincided with the resonance would fail even a new motor. If the test were redone at a slightly different motor speed the motor would pass.



Vibration Spectrum @ 1742 RPM Superimposed on Structural Response Characteristics

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