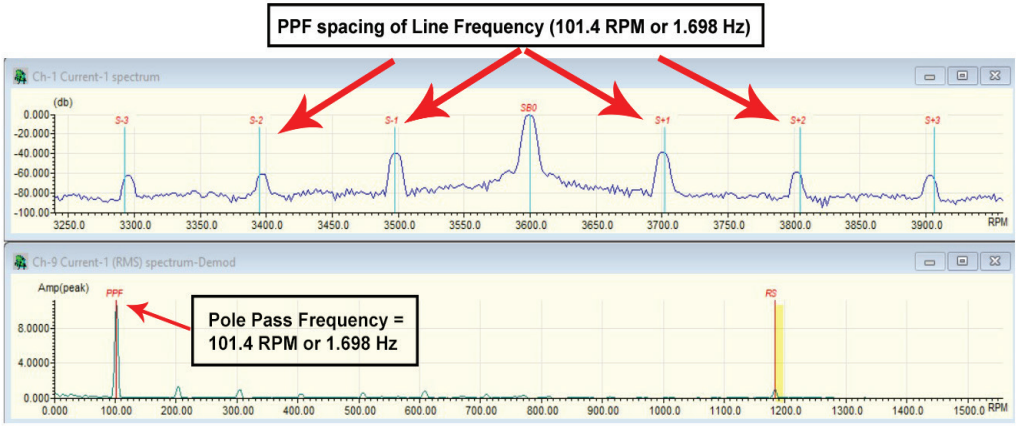
TECH TIPS

Tech Tip #5 - May 2020

Rotor Bar Analysis using Electrical Signature Analysis

A broken or fractured rotor bar fault can occur with excessive starts, large loads, manufacturing processes, etc. When a broken rotor bar occurs, there is no longer a path for current to flow. This creates stress on the neighboring bars in the form of increased current and heat. Eventually these rotor bars fail over time. Electrical Signature Analysis (ESA) evaluates the current and voltage spectrums using a Fast Fourier Transform (FFT), which converts the time waveform to a frequency spectrum. The FFT highlights amplitude and frequencies to identify mechanical faults such as broken or fractured rotor bars.



Generally broken or fractured rotor bars are found as elevated Pole Pass Frequency (PPF) sidebands of line frequency (LF). PPF is calculated using the synchronous speed minus the running speed times the number of poles. In this ESA sample there are PPF sideband spacing around LF (3600 RPM or 60 Hz) in the current -1 spectrum.

3 phase AC motor example:

- 460V, 1200 RPM (synchronous speed), 6 Pole motor, 1183.1 RPM (running speed), 60Hz (LF).
- 1200 RPM synchronous speed – 1183.1 RPM running speed = 16.9 RPM
- 16.9 RPM x 6 (# of poles) = 101.4 RPM or to work in hertz use 101.4RPM / 60 seconds = 1.69 Hz
- PPF = 101.4 RPM or 1.69 Hz

Vibration and infrared may indicate an initial problem. Using ESA technology, you can pinpoint your motor's actual problem or verify its condition.