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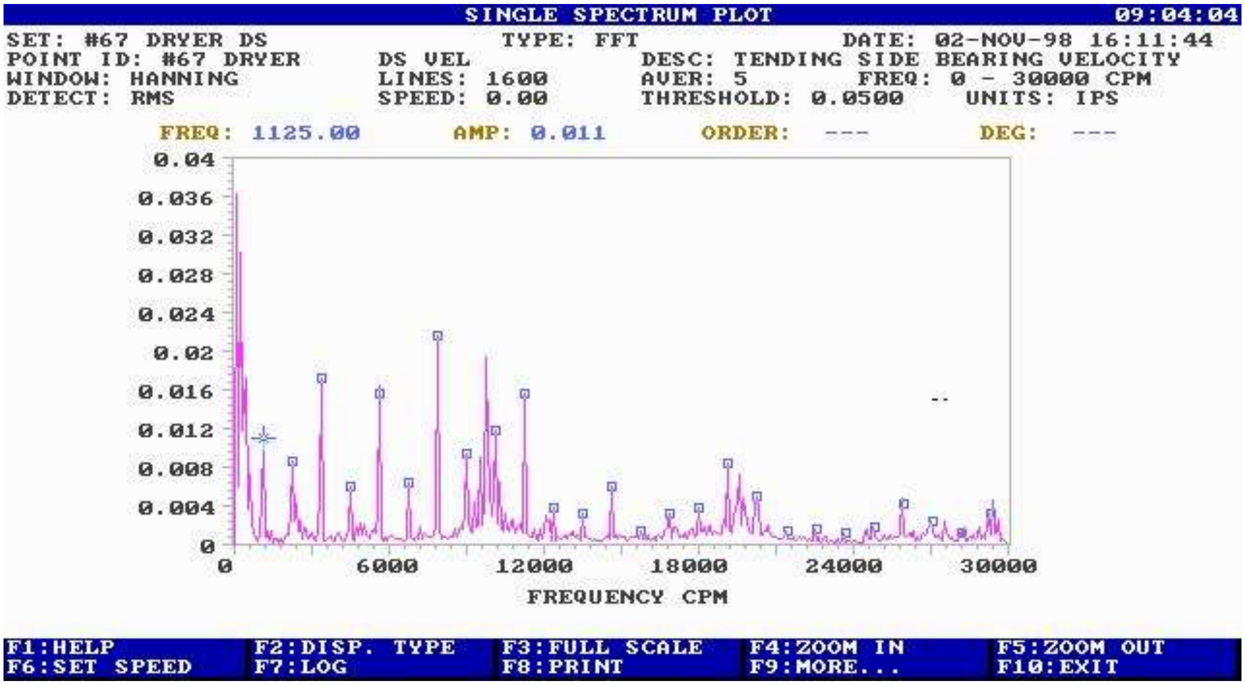
The Vibration Analysis Technology

Until about 25 years ago, maintenance was primarily managed by machines. The machines "decided" schedules, parts inventories and production availability. Human management was almost purely reactive: "When it breaks, we'll fix it." Machine availability was improved by maximizing the use of a Predictive Maintenance (PdM) tool known as condition monitoring.

When we think of Condition Monitoring, we usually think of vibration analysis. The technology and techniques have been developing for over 30 years and over 78% of all manufacturing or processing plants use vibration analysis. Vibration analysis of rotating machines such as motors, pumps, fans, and gears is widely accepted as a viable technique to identify changing conditions. Reduced costs of test equipment and data management (primarily computers), availability of training, and development of computer-based expert systems are all contributing to this acceptance.

The technique measures machinery movement (vibration), typically through the use of an accelerometer, and examines the vibration spectrum to identify and trend frequencies of interest. Some frequencies are associated with the machine design, regardless of its condition. For example, a healthy fan or rotary compressor may have a frequency that is equal to the machine speed times the number of fan blades. The vibration analyst may monitor this frequency to note changes in the amplitude indicating a degrading condition. Other frequencies, for example, those associated with rolling element bearings, may be a sign of bearing damage and will alert the analyst to the start of bearing failure. It is common for electric motor problems, such as broken rotor bars or stator eccentricity, to be seen in vibration associated with electrical line frequency. In new equipment, vibration analysis can identify defective bearings and confirm proper alignment and balance at installation.

The vibration data is usually collected with a portable device for periodic monitoring, or a continuous monitoring system may be installed for cost or critical systems. Analysis of the vibration data requires a detailed understanding of machinery operation and of vibration analysis techniques. Vibration data is usually collected and analyzed on a monthly to quarterly basis (on continuously-running equipment). Costs vary due to machinery locations (the more spread out, the higher the cost) but typically are $3 to $5 per bearing depending on the quantity. The following examples demonstrate the effectiveness of the vibration analysis technology for identifying bearing related defects. In addition, vibration analysis is useful in determining many other types of machine faults including: unbalance, misalignment, mechanical looseness, DC drive controller problems, faulty sleeve bearings, bad gears, belt and chain defects, resonance, softfoot, electrical faults, etc.

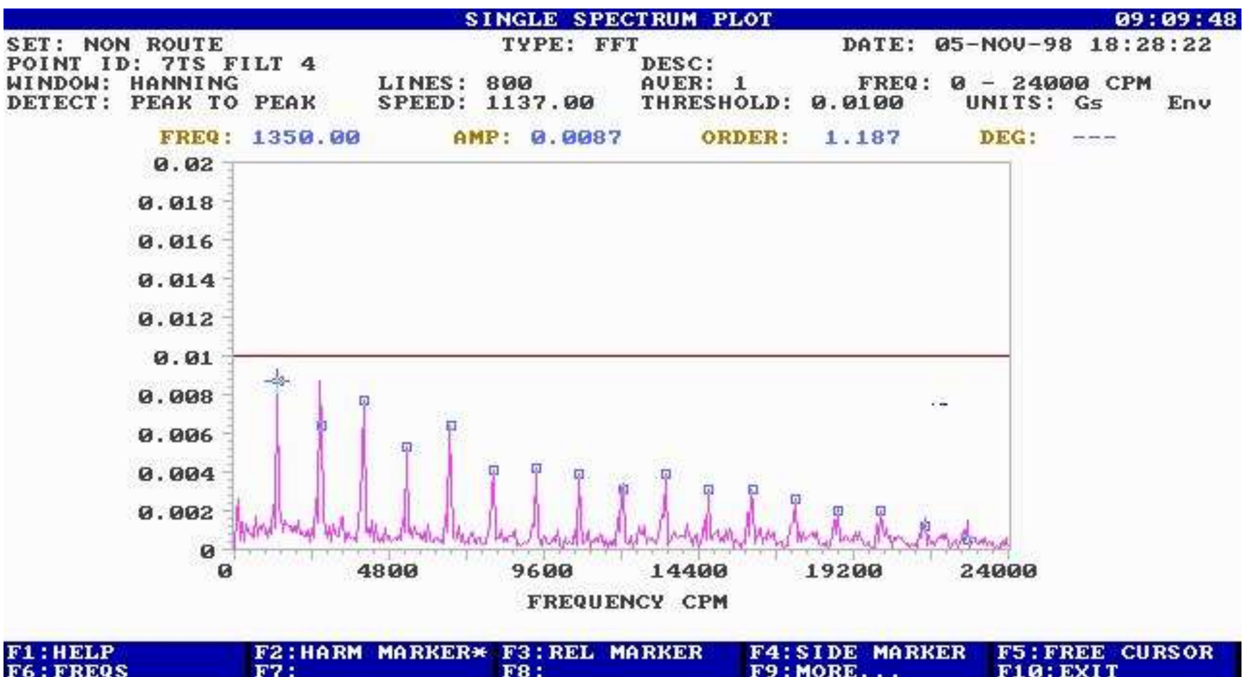


Harmonics of outer race defect frequency (1125 RPM) marked in spectrum. Note outer race defect in photo below.

The spectrum above shows harmonics of at this bearings outer race defect frequency RPM. These produced by a defect ½ inches wide.

The defects can be seen in this photo the bottom of the outer race. at 1125 frequencies were 8 inches long and 1

Is your plant utilizing this powerful PdM tool to detect potential failures such as this?



Harmonics marked in spectrum are calculated inner race defect frequency of 1350 RPM due to a cracked inner race. Note the cracked inner race in the photo below.


T.S. Dryer #7