Powerful Software Applications

Rotating Machinery Diagnostics

Engineered for SignalCalc Dynamic Analyzers

- ACE
- Mobilyzer
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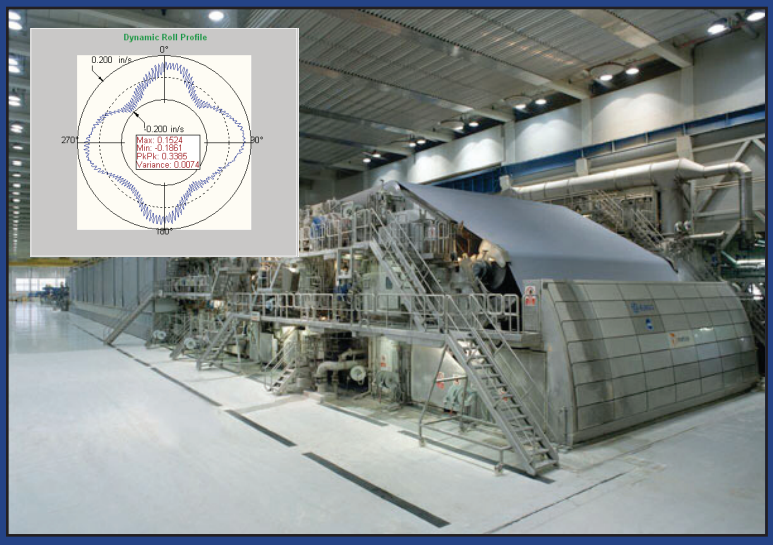

Machinery Diagnostics

Organized efforts directed towards ensuring long trouble-free operation of rotating and reciprocating machinery are now, more than ever, the focus of many industries. Process machinery, aircraft engines and automotive drive trains are examples of machines that are required to operate efficiently and safely, or the consequences can be catastrophic, both in terms of personal injury and operational costs. The measurement and analysis of vibration is a cost-effective non-destructive method of diagnosing the possible development of failure conditions. The SignalCalc family of Dynamic Signal Analyzers provides a wealth of measurement and analysis options, designed to make effective machinery diagnostics efficient and accurate.

RPM-Based Measurements

Whether designed to operate at a fixed speed or over a wide range of speeds, it is essential to be able to relate the vibration characteristics of a machine to its rotational frequencies. The RPM-Based Analysis option does precisely this. This option accepts a periodic signal or pulse train from a tachometer or shaft encoder applied to a Trigger input. It provides the software with knowledge of the instantaneous speed of the machine and this information is used to pace waterfall displays and other signal analysis. The measured RPM can be automatically assigned to results, facilitating automated order tracking. The machine speed can also be used to start and/or stop a measurement session.

SignalCalc analyzers offer an array of RPM based measurements that are not normally found in other systems. The Sweep mode provides continuous spectral measurement at constant rpm intervals during a machine run up or coast down. When averaging at each rpm is required (to improve signal to noise ratio), the Stepped mode is used. The user controls the shaft speed to allow averaging and identifies when to ramp to the next rpm. Steady mode allows monitoring of the vibrations of a shaft operating nominally at a constant rpm.

Waterfall Analysis

The Real-Time Waterfall option provides pacing of real-time measurement to create a three dimensional data array usually displayed as a waterfall. This facility is commonly employed in studying the dynamic behavior of rotating machinery and mapping the time/frequency variations of sounds. Several x,y,z graphic formats, including spectrogram, fine spectrogram, cascade, surface, standard waterfall and Campbell diagrams are provided, making the SignalCalc environment unparalleled in its ability to dynamically map 3-D data. Also available is the ability to view any constituent record or a slice across all records at a single frequency (or time) value.

Waterfalls can be created from instantaneous or averaged spectra including single and dual-channel measurements. Waterfalls provide time/frequency/amplitude displays. The horizontal (x) axis is either frequency or time, the vertical axis (y) is amplitude and the inclined axis (z) represents time or machine speed.

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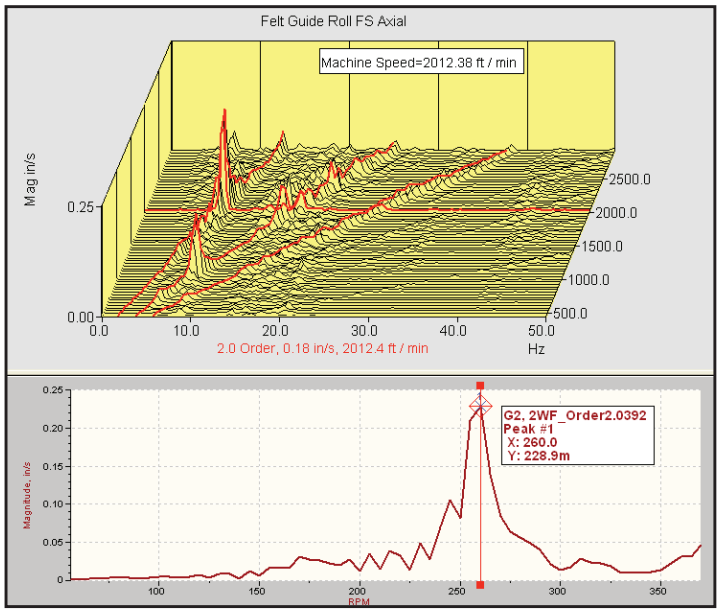
Order Tracking

The Order-Tracking option provides an important capability for the analysis of rotating machinery. It synchronizes the sampling of input signals to the instantaneous angular position of the machine shaft using a resampling technique. A constant number of samples per revolution are acquired so that the analysis is in the order domain rather than the frequency domain as it would be if the data were digitized using a constant number of samples per second. Once the data is analyzed in the order domain, analysis displays such as revolution histories and order spectra are available. The user simply specifies the machine speed range, the highest order of interest for the analysis and the order resolution required.



Synchronous Averaging

In synchronous averaging mode, a tachometer input is used to trigger a synchronous averaging process. This process removes the contribution of asynchronous vibration sources from a time or linear spectral average to isolate the contribution of synchronous rotating components. Non-synchronous components such as noise or structural resonances are removed from the analysis.

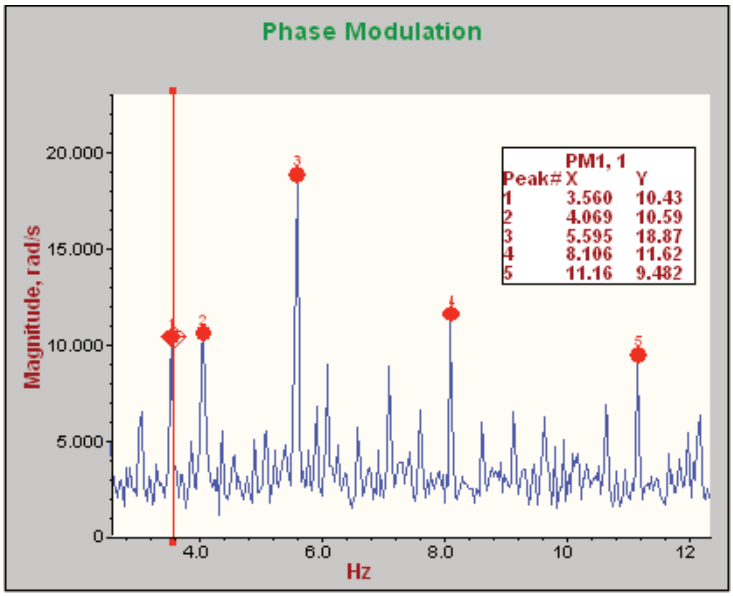
An exceptional variety of display types are available for the demanding requirements of rotating machinery analysis and visualization . Many of these have typically been available only in systems dedicated to very specific applications. SignalCalc analyzers are uniquely flexible for a wide range of applications yet intuitively focused on multiple process and power industry applications.

Demodulation

The demodulation option in selected SignalCalc analyzers offers amplitude and frequency/phase demodulation. This measurement computes the Hilbert transform and constructs the Analytic (envelope) signals from which the amplitude modulation (AM) and phase modulation (PM) signals are extracted. Demodulation can be combined with zoom to concentrate the analysis on the bandwidth of interest. This powerful implementation can also be combined with synchronous average. A significant improvement on the signal to noise ratio can be achieved by triggering the data acquisition relative to a single synchronous component.

Demodulation is useful when signals of interest are mixed in with other signals as modulations of frequency or amplitude (thus the mix is a multiplication, not merely an addition) and when signals are obscured by noise or harmonics of the other signal components. Common applications for this option include the analysis of rolling element bearing and gear defects. For example, when high gear mesh vibration is encountered in a mechanical drive system, the root cause of the problem is usually pinpointed by identifying the frequency of the gear mesh frequency AM. This will correspond to the frequency of the problem gear.

Demodulation analysis allows measurement of the analytic or synchronous average signal in the time domain, as well as the auto power or synchronous average amplitude and phase modulation in the frequency domain.



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