BEARING ENVELOPE ANALYSIS

THE EASY TO USE TOOL TO MONITOR BEARINGS, AND TO DETECT AND DIAGNOSE BEARING FAULTS

ROTATING MACHINERY
**FUNCTIONALITY**

Envelope analysis is a technique to detect and diagnose faults on roller bearings. Bearing Envelope Analysis is based on demodulation of the high-frequency resonance associated with bearing element impacts.

When the elements strike a local fault, an impact is produced. These impacts have different typical repeating frequencies depending on the geometry of the bearing and the rotational frequency. The repetition rates or bearing frequencies are unique for each type of bearing and are calculated according to fixed mathematical formulae.

The impacts modulate a signal at the associated bearing pass frequencies, such as Cage Pass Frequency (CPF), Ball Pass Frequency Outer Race (BPFO), Ball Pass Frequency Inner Race (BPFI), and Ball Fault Frequency (BFF).

Envelope Analysis is based on the FFT (Fast Fourier Transform) frequency spectrum of the modulating signal. When the original signal is amplitude modulated, the envelope analysis extracts the modulating signal (amplitude demodulation). The result is the time history of the modulating signal. This signal can be studied directly in the time domain or it can be subjected to frequency analysis.

**APPLICATIONS**

Envelope analysis is applied in industries using rotating machinery, e.g. steel, paper, chemical or textile production, generating power.....

**SUPPORTED SENSORS**

We support most industry-standard Accelerometers with BNC connection and Voltage, IEPE and Charge output. Our patented DualCoreADC® technology allows you to measure a large range of signal amplitudes without the need to switch between ranges. With the benefit of one additional counter per channel, ACC+, you can measure Vibration an RPM with full synchronization and in a compact format.

Connector types: BNC,
- Input options: Voltage, IEPE, Charge
- Supported sensors: Single or multi-axial accelerometers
- Speed acquisition options: Tacho, Tape sensor, Encoder, gear tooth or any RPM sensor with 5V TTL signal output.
- Speed acquisition inputs: Counter, Analog in with Angle Math

In any manufacturing or processing plant where rotating equipment is used, bearing failures are the most common machine faults. To ensure reliable operation vibration analysis is used for machine diagnosis, including condition monitoring and fault diagnosis of rolling element bearings.

Bearing Envelope Analysis (BEA) enables detection and diagnosis of faults on bearings by extracting periodic impacts from a machine's vibration signal.

The Dewesoft Envelope Analysis offers a value-for-money solution based on a combination of first-class data acquisition units and powerful software. It provides an easy to use interface and fast configuration with all functionality, including recorder, bearing database, freely definable envelope, and signal bandwidth as well as predefined bandwidth settings (Envelope 1 - 4).

**INTRODUCTION**

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KEY FEATURES

MULTIPLE BANDWIDTHS
Predefined bandwidth settings (Envelope 1 - 4) or freely definable envelope and signal bandwidth. Multiple bandwidths simultaneously.

DATA
Time-domain data together with frequency domain data.

BEARING DATABASE
Possibility to add a custom bearing to the database.

MULTI-PURPOSE ADVANCED MARKERS
Bearing marker - shows the position of bearing faults in the frequency spectrum, max marker, free marker, zoom marker, sideband marker, harmonic marker.

KINEMATIC MARKERS
Different machinery sets can be created in a database. Simplified fault detection during measurement through adjustment of all markers when main frequency is changed.

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ANY LINE RESOLUTION
Freely selectable line resolution for most demanding tasks.

EXPORT
Data export to most often used formats: UNV, Excel, Matlab, Flexpro, TXT, CSV...).

AVERAGING
Block history with linear, peak, exponential averaging or overall calculation.

CURSOR VALUE ESTIMATE
Innovative window interpolation technique allows precise amplitude and frequency estimation.

BEARING DATABASE
Possibility to add a custom bearing to the database.
DAQ SYSTEM - SIRIUS ACC TYPE INPUT

**Inputs**
- **Input types:** Voltage, IEPE
- **ADC Type:** 24bit delta-sigma dual core with anti-aliasing filter
- **Sampling Rate:** Simultaneous 200kS/sec

<table>
<thead>
<tr>
<th>Ranges (Dual Core Low Range)</th>
<th>±10V (±500mV)</th>
<th>±500mV (NA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Accuracy (Dual Core)</td>
<td>±0.1% of reading ±10(1)mV</td>
<td>±0.1 of reading ±1(NA)mV</td>
</tr>
<tr>
<td>Dynamic Range@10kS (Dual Core)</td>
<td>140 dB (160 dB)</td>
<td>135 dB (NA)</td>
</tr>
<tr>
<td>Typ. SNR@50kS (Dual Core)</td>
<td>107 dB (125 dB)</td>
<td>100 dB (NA)</td>
</tr>
<tr>
<td>Typ. CMR @ 50Hz/1kHz</td>
<td>140/120 dB</td>
<td>140/120 dB</td>
</tr>
</tbody>
</table>

**Gain Drift**
- Typical 10 ppm/K, max. 30 ppm/K

**Offset Drift**
- Typical 0.5 μV/K + 2 ppm of range/K, max 2 μV/K + 10 ppm of range/K

**Gain Linearity**
- <0.02%

**Inter Channel Phase-mismatch**
- 0.02° * fin [kHz] + 0.1° [@ 200 kS/sec]

**Channel Cross talk**
- >160 dB @ 1kHz

**Input Impedance**
- DC, AC 0.1 Hz, 1Hz

**Input Impedance**
- 1 MΩ (270kΩ for AC coupling ≥ 1Hz) in parallel with 100pF

**Overvoltage Protection**
- In+ to In-: 50 V continuous; 200V peak (10msec)

**IEPE mode**
- **Excitation:** 2, 4, 8, 12, 16 or 20mA
- **Compliance voltage:** 25 Volt
- **Output Impedance:** >100 kΩ
- **Sensor detection:** Shortcut: <4Volt; Open: > 19Volt

**Additional Specifications**
- **Input connector BNC:** BNC
- **TEDS support:** IEPE mode only

**SOFTWARE: DEWESoft X3**

**Recommended**
- **Processor:** Intel Core i7 with 4 Cores (3rd generation or higher)
- **RAM:** 8 gigabyte (GB)
- **Hard drive:** Solid-state drive (SSD)
- **Graphic card:** Compatible with DirectX 11
- **Display:** 1280x720 (HD Ready)
- **Operating system:** Windows 10 64-bit

*Actual requirements may be different due to specific setup configuration.

**TYPICAL CONFIGURATIONS**

**BASIC Bearing (4Ch):**
- Sirius MINI 3xACC, 1xACC+
- Accelerometer (1x-4x)

**STANDARD Bearing (8Ch):**
- Sirius Dual core 6xACC, 2xACC+
- Accelerometer (1-8)

**OPTIONAL:**
- Tacho

**ADVANCED Bearing:**
- 100+ ACC or CHG channels in configuration of chained Sirius slices or Krypton

**RELATED PRODUCTS**
- FFT
- Order tracking
- Torsional vibration
- Balancing