They trust Oros

> “From rotating analysis to structural dynamic analysis: with my OROS system, I am ready for everything when I go out in the field.”

Greg PARKER, 39
Noise and Vibration technician, Installation & Maintenance division.

1- Improve Efficiency
2- Maximize Uptime
3- Minimize Costs

Test Cells
- Prototype validation
- Overhaul and acceptance at OEM

Field Testing
- On-site commissioning
- Machinery startup
- Predictive maintenance
- Installation vibration signatures
- Diagnostics and troubleshooting

Remote Monitoring
- After installation follow-up
- Random & unrepeatable phenomena

Made for Your Demanding World

OROS Solutions
Boost your Efficiency

Based on a range of modular instruments, from 2 to 32 channels, the Teamwork technology enables to cascade or distribute the analyzers to measure up to 1000 channels. Instruments, conditioners and software licenses are exchangeable and flexible. Data are also easy to share thanks to the native technology.

SOFTWARE R&D, Acceptance, Diagnostics

Data Acquisition
- Recorder
- Time Domain Analysis
- Spectral monitoring

Rotating Analysis
- Turbomachinery vibration: OMBiGate
- Reciprocating machines diagnostics: EngineDiag
- FFT, spectral based diagnostics
- Balancing: single, dual & multiphase
- Synchronous Order Analysis
- Torsion & Twist

Structural Dynamics
- FRF’s, Resonances
- ODS (Operating Deflection Shape)
- Modal analysis

Noise Analysis
- 1/3rd octave
- Sound Intensity
- Sound Power
- Air Holography
- Electric motors

INSTRUMENTS from 2 to 32 channels, distributed up to 1000+

Flexible Connection
- Mobile analyzer
- Distributed configuration
- Remote access
- Large channel count systems

Multioperations
- PC free recorder
- Online & post analysis
- Multianalysis
- Handling any transducers

Made For the Field
- Portable
- Rugged
- Real-time
- Multi-channel

Accurate
- DSP-based
- 24 Bit – 40 kHz – 140 dB
- ± 40 V input range
- ±0.02 dB / ±0.02°

INSTRUMENTS

Optimize costs and predict failure
- Data and signals recording based on alarm level triggering
- Collect raw signal information for thorough office processing

Travel light for reliable tests
- Versatile toolbox for all noise and vibration diagnostic applications
- Portable and rugged analyzers for the field measurements
- Multi-channel simultaneous acquisition for run-up and coast downs
- Real-time analysis for field efficiency
- Full signal recording for office processing and archiving

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Measuring your Rotating Machinery

Rotating Analysis

Fluid Film Bearings
Relative shaft vibration is captured with proximity probes. Analyzing this data requires a number of software tools such as orbi and shaft centerline as well as order analysis (RX, Bode, Polar, etc.). ORBISGate, the OROS turbomachinery vibration solution, features these analysis and many more analysis tools. These tools display the physical motion of the shaft and let you detect faults such as oil whirl & whip, preload, misalignment, rub and others.

Roller Bearings
Damaged roller bearings are common. Their vibration signatures are usually measured with an accelerometer mounted on the bearing housing. In particular, the FFT-Diagnostics module uses envelope demodulation to analyze these vibration sources to determine if the source is from the roller elements or the races.

Gear Analysis
Gear boxes have a complex vibration signature, usually occurring at high frequencies. The FFT-Diagnostics tool, such as cepstrum, kurtosis and harmonic markers are necessary to describe and understand the generated vibrations. The virtual tachometers management feature allows the analyst to determine the speed and phase information based on the gear ratio.

Reciprocating Machines Analysis
Reciprocating machines are complex installations. They generate specific vibration signatures. The objective is their performance optimization and faults detections. For example, injection delay, valves faults, segmentation wear can be identified with EnginEye. This software module integrates the machine mechanical properties: number of cylinders, firing order and timing diagram, allowing to provide pertinent decision criteria on the field. Time signal, overall levels as well as angle-frequency representation on the machine cycle are efficient results for diagnostics.

Torsional Analysis
Torsional vibration and torque fluctuation are usual phenomena especially on large internal combustion engines. The OROS torsional software module utilizes a frequency to voltage converter for speed input providing the following information: the angular velocity profile displays FRM variations. 2 pulse train combination detects torsional resonances.

Balancing
Imbalance is probably the most common source of vibration on rotating machinery. Depending on the machine and the rotating speed range the rotor can be considered to be rigid or flexible. In the first case, the Single Dual plane balancing module will be used. In the second case a multplane approach should be preferred and the associated Multiplane module should be used.

Electric Motors
Electric excitations can be easily characterized (PWM, slotting...) thanks to the e-markers that highlight directly the right frequencies. On top of that, the spatiogram is a unique tool to quickly quantify the electromagnetic excitation distribution responsible of the vibrations. Finally, sound design allows to playback and listen the motor noise separating and designing the various sources (aerodynamical, mechanical and electromagnet).

On-Site Measurements & Applied Trainings
Experts from OROS come on-site for applied trainings. They will help you using your OROS system. They can provide assistance in your measurement. They are also able to recommend optimization in your measurement process depending on your application and field requirements.

Structural Dynamics

ODS (Operating Deflection Shape)
Operating deflection shape is an important analysis procedure used to locate machinery and piping system deflection during operation. It is based upon simplified-geometry description of the machine train. After measuring the vibration response at multiple locations, the mechanical source can be identified. The ODS software module helps to determine vibration sources, a transmission point and eventually a mechanical modification to be implemented.

End Winding Bump Testing
Generators and motors windings are strongly excited by frequencies not twice the network frequency: any mode nearby that frequency will create high vibration response. FFT analyzers and Modal, the OROS Structural Dynamics module, are well adapted for bump tests acquisition, resonant frequency determination and deflection shapes.

Blade Modal Testing
When blade dynamic structural characteristics should be determined, they are submitted to modal testing: based on impact hammer testing or shaker excitation. Based on multichannel analyzers, vibration response can be captured by accelerometers or strain gauges. Modal, the OROS Structural Dynamics module, can process the FRFs to give the modal characteristics.

Damping & Isolation
Dynamic coupling between machine trains and their skids or foundations can be a problem during the machine installation and the field acceptance test. Excitation frequencies should not match the response frequencies of the hosting structure: the mounting choice is key. To tackle this issue, OROS products such as transfer functions, ODS, and damping calculations assist the user in the procedures.

Noise Analysis

Octave & Sound Intensity
The ambient noise generated from rotating machinery can be evaluated using general tools such as the 1/3 octave analysis. But more thorough measurements can be achieved using the sound power value. The sound intensity technique is often completed in the field thanks to its portability and adaptability.
OROS is a global manufacturer and solution provider of noise and vibration measurement systems.

OROS masters the latest technology of data acquisition, digital signal processing as well as user interface software.

OROS instruments are used in the major sectors of industry and research, for industrial acoustics, structural dynamics and rotating machinery applications. Hardware and software are totally designed in-house.

OROS instruments are renowned as being designed for the field but powerful enough for any lab.

Software Modules
Rotating Analysis
ORNV-ORB ORB Gate, the dedicated Turbomachinery Vibration Solution
ORNV-SCA Synchronous Order Analysis plug-in
ORNV-FFT Diag Spectral Based Diagnostics software Module (Envelope, Cepstrum, Pk, Pk-Pk, Crest factor, shaft view)
ORNV-IVC Integrated Instantaneous angular Velocity Converter plug-in, allows on-line and offline torsional analysis
ORNV-BAL Single Dual Plane Balancing module
ORNV-BAL-MP Multiplane Balancing module
ORNV-ENG EngineDiag, Reciprocating Machines Diagnostics Software Module

Structural Dynamics
ORNV-FFT Real-time FFT plug-in
ORNV-MOD-ODS ODS (Operating Deflection Shape) Solution
ORNV-MOD-MIMO ODS (Operating Deflection Shape) and Modal Analysis Solution

Data Acquisition
ORNV-REC Recorder
ORNV-TDA Real-time time domain analysis plug-in

Noise Analysis
ORNV-OCT Real-time filter based 1/3 octave plug-in
ORNV-SI Sound Intensity Solution
ORNV-SP Sound Power Solution
ORNV-AH Air Holography Solution

Instruments
Analysers: examples of configurations
Above software options may be added to these configurations
OR34-FREQ-4 OR34-4 Ch. FFT analyzer
OR35-FREQ-8 OR35-8 Ch. FFT analyzer
OR36-FREQ-16 OR36-16 Ch. FFT analyzer
ORMP-FREQ-16 Mobipack-16 Ch. FFT analyzer
OR38-FREQ-32 OR38-32 Ch. FFT analyzer

Inputs Conditioners
OR36/8-PXD-B 8 Ch. Strain gauges bridge conditioner XPod for OR36 & OR38
OR36/8-XPOD-V 3 Display analog and digital vumeter monitoring XPod
OR36/8-PXD-T 8 Ch. PT100 and thermocouple conditioner XPod for OR36 & OR38

Specifications
Channels count 2 to 1000+ channels - Distributed configuration

Inputs
Sampling 2 Ks/s to 102,4 Ks/s - 24 bits delta sigma ADC
Accuracy Phase ±0.02° - amplitude ±0.02 dB - Dynamic > 160 dB
Conditioning AC/DC/ICP/TEDS up to ±40 V

Auxiliaries
Outputs DC to 40 kHz - ±10 V range - 24 bits DACs - THD < 0.002%
Ext. synch (Trigger / Tach) 64 x over sampled (6.5 MHz) - Resolution < 160 ns (0.06° @ 1 kHz) - up to 40 V
DC channels* Sampling 10 Hz - 50 Hz/60 Hz rejection - reproducibility <1 mV

System
Hard disk 128 to 612 GB SSD
Internal battery up to 3h
Link to PC 1 Gb/s Ethernet
Weight from 1.4 kg/3 lb to 10 kg/22 lb

Find out more on the OROS offer in the Range brochure. Downloadable on www.oros.com

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