

# Noise & Vibration

Test and Measurement Solutions

for Marine Industries



# OROS Solutions

## Enhance your Efficiency

### INSTRUMENTS

#### 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

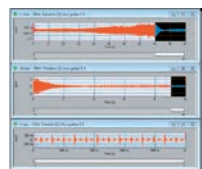
#### Accurate

- > DSP-based
- > 24 Bit – 40 kHz – 140 dB
- >  $\pm 40$  V input range
- >  $\pm 0.02$  dB /  $\pm 0.02^\circ$



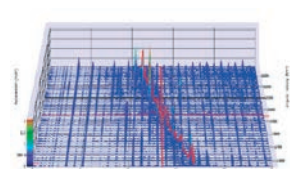
### SOFTWARE R&D, Acceptance, Diagnostics

#### Data Acquisition



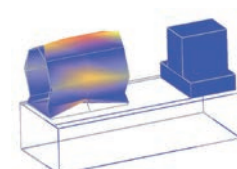
- > Recorder
- > Time Domain Analysis

#### Rotating Analysis



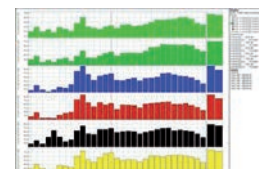
- > Spectral Based Diagnostics
- > Torsion and Twist
- > Synchronous Order
- > Reciprocating Machines Diagnostics: EngineDiag
- > Balancing

#### Structural Dynamics



- > FFT
- > ODS (Operating Deflection Shape)
- > Modal analysis

#### Noise Analysis



- > 1/3rd octave
- > Sound Intensity

### SERVICES Anywhere Close to You



#### Training

- > Initial
- > Advanced
- > Webinar



#### Renting

- > Instruments
- > Software modules

#### Coaching

- > Software customization
- > Assistance in your measurement
- > Expertise in diagnostics



#### A Dedicated Team

- > Dynamic and responsive Services department
- > Worldwide hotline
- > Global Accredited Maintenance Centers (worldwide coverage)



#### Maintenance and Contracts

- > Premium contracts
- > Software updates
- > Hardware upgrades
- > Calibration



# Made for Your Demanding World

1- Improve Efficiency

2- Maximize Uptime

3- Minimize Costs

## Test Cells

- > Prototype validation
- > Factory acceptance



## Improve production testing efficiency

- > Integrated & automated test process and report generation
- > User friendly operation
- > Multichannel real-time processing and displays
- > Universal and multiple sensor's types: microphones, acceleration, temperature, strain, pressure...

## On-board Testing

- > On-board acceptance
- > Maintenance operation
- > Diagnostics and troubleshooting



## Travel light for reliable tests

- > Versatile toolbox for all noise and vibration diagnostics applications
- > Distributed acquisition systems over the ship
- > Portable and rugged analyzers for field measurements
- > Multichannel simultaneous acquisition
- > Real-time analysis for field efficiency
- > Distributed acquisition systems over the ship

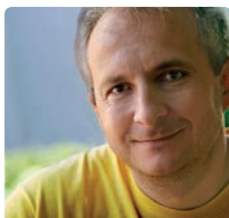
## Remote Monitoring

- > Random & unrepeatable phenomena



## Optimize costs and prevent failure

- > Alarm triggering warning via email or the Internet
- > Collect raw signal information for thorough office processing



### They trust OROS

- > "With my OROS analyzer, I'm really confident during on-board measurements thanks to its toughness and its complete panel of functions."

Chris RINGLE, 44  
Noise and Vibration Maintenance Engineer,  
Propulsion Department.

# Measuring your Ships and Propulsors



## Rotating Analysis



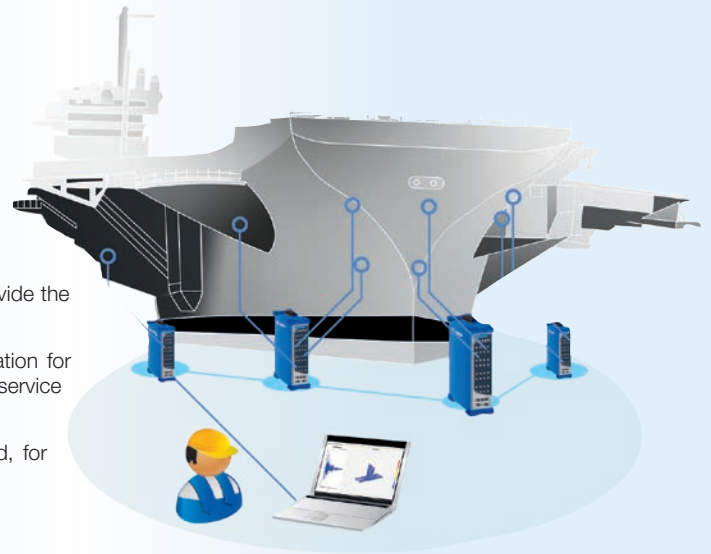
### Torsional Analysis

On reciprocating machinery the cause of vibrations often comes from the non-linearity of the angular speed.

Thanks to the **integrated frequency to RPM** converter, the OROS analyzers provide the instantaneous angular speed inside each shaft revolution.

The **analysis of this speed in frequency or time domain** give helpful information for vibrations reduction during prototyping or for source identification while doing service diagnostics.

With **torsional analysis**, detect, follow the torsional resonance of the shaft and, for example, identify problems due to flexible coupling



### Reciprocating Machine 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 EngineDiag. 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.

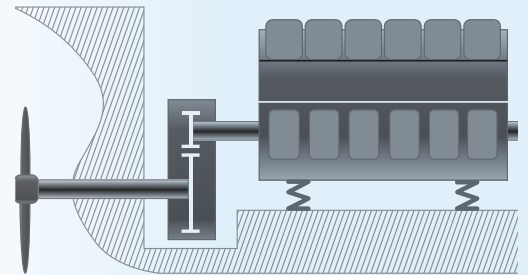


### Gear Analysis

Gearboxes is a very critical part of transmission and has specific vibration signature requiring correlation or cepstrum analysis for an accurate diagnostics.

The **correlation** is useful to determine the correlated part of signals from different locations on a structure. This helps tracking the root and cause of vibration phenomena machinery structure and/or cinematic.

The **cepstrum** is an efficient tool to detect periodic shocks in bearings or parts of rotating machinery. It is specially adapted when the spectrum levels are noised with their impulsive components.



### Roller Bearing Analysis

Damaged roller bearings are common vibration sources. Their vibration spectrum, measured with an accelerometer mounted on the casing, allows you to determine mechanical failures on balls or races. **Envelope demodulation and kinematics markers**, part of FFT-Diag module, are the key tools for that purpose.

## 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.



# ulsion Systems

## Shipbuilding

- > Hull
- > Tower
- > Air Conditioning
- > Pumps
- > Compressors

## Propulsion Systems

- > Gas Turbines
- > Diesel Engines
- > Generators
- > Motors
- > Gearboxes
- > Flexible Coupling

## Structural Dynamics



### ODS (Operating Deflection Shape)

A powerful analysis to solve problems related to forced vibrations. Only with few measurement points, determine the source of high vibration level and the structural modifications to be implemented on the machine.



### Damping & Isolation

Absorbing and damping mounts are the components through which the vibration energy is transmitted between the engine and the rest of the ship: their properties, dimensions and positions should be determined with care. The techniques used are **cross spectrum**, **transfer functions**, **damping**, as well as **ODS (Operating Deflection Shape)**.



### Modal Analysis

Modal Analysis is one of the key steps when testing machines: it determines their structural characteristics and so, defines how they reacts to operating excitations. **Shaker or impact hammer** excitations can be used to capture the experimental datasets: the final stage is the actual **OROS modal analysis**.

## Noise Analysis



### Structure-Borne Noise Analysis

This technique uses acoustics tools, typically 1/3 octave analysis. The results allow to identify and reduce the transmission to Structure-Borne Noise.



A world map showing the global distribution of OROs (black dots) and OROs Offices (grey dots). The map includes all major continents and oceans. Black dots are concentrated in North America, Europe, and Asia. Grey dots are scattered across Africa, South America, and Australia.

Now approaching 30-years in business, OROS instruments are renowned as being designed for the field but powerful enough for any lab.



Downloadable on  
[www.oros.com](http://www.oros.com)

\* Optional features

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