Vibration Measurement and Analysis
Vibration monitoring and analysis

Vibration measurement and analysis is an important instrument for characterization, monitoring and diagnostics of machinery, structures and plants.

SINT Technology has longstanding expertise in the vibration field and is able to provide a wide range of services, including:

- Diagnostics of rotating and reciprocating machinery
- Troubleshooting
- Predictive monitoring
- Torsional vibration
- Modal analysis
- Dynamic characterization of materials

Our services are characterised by:

- the professionalism guaranteed by highly skilled engineering technicians
- dynamism and flexibility
- willingness to perform testing on the customer’s plant in all parts of the world
- detailed reporting in accordance with the customer’s requirements and the main international technical standards

SINT Technology operates in various areas:

- OIL & GAS
- Energy
- Rail
- Automotive
- Aviation
- Paper
- Steel
- Civil
Vibration analysys on rotating and reciprocating machines

Analysis of the vibration behaviour of machinery is one of the most important and effective techniques for monitoring the "state of health" of a machine. At the same time, vibration analysis makes it possible to identify the main causes of malfunctions, including:

- Wear of rotating parts
- Misalignment
- Unbalance
- Loosening
- Resonances
- Abnormal gear conditions
- Pump cavitation
- Beating phenomena

SINT Technology performs diagnostic and troubleshooting services for rotating and reciprocating machinery, for example:

- Frequency domain analysis (FFT)
- Time domain analysis (Trend)
- Transient analysis (start-up and coast-down)
- Waterfall charts
- Orbit analysis
- Bode diagrams
- Campbell diagrams
- Polar plot
Balancing rotating machinery (Trim balancing)

High vibration in a rotating machine is mostly due to unbalance of the rotating components (rotors, shafts, etc.). High vibration due to unbalance of rotating components can cause damage to the shaft, bearings, structures and foundations. Unbalance in a machine can be the result of engineering flaws, errors in the machining and assembly stage or can develop as a result of extended operation due to machine wear, the effects of temperature, etc.

Torsional vibration and torque

Analysing vibration and torsional resonance is an extremely effective diagnostic tool for identifying abnormal conditions during operation of a machine which can lead to damage, such as:

- Coupling/drive shaft failure
- Accelerated gear wear and gear tooth failure
- Key deformation
- Slippage of coupling hubs
- Premature wear of electric motor windings
- Irregular output

SINT Technology can perform torsional analyses on a wide range of machinery thanks to its advanced measurement systems and processing software.

Due to these advanced measurement systems and processing software, SINT Technology is also able to perform any type of signal analysis:

- Frequency domain analysis (FFT)
- Time domain analysis (Trend)
- Transient analysis (start-up and coast-down)
- Waterfall charts
- Bode diagrams
- Order analysis
Experimental modal analysis (EMA, OMA, ODS)

Experimental Modal Analysis (EMA) is an effective instrument for describing, understanding and modelling the dynamic behaviour of a structure.

It can be carried out both to determine the natural frequencies and mode shapes of a structure and to verify accuracy and calibrate a finite element model (FE).

Also, the EMA can be used in order to make a troubleshooting vibration problems.

An example of the analysis techniques that SINT Technology can use are:

- Impulse excitation (instrumented hammer)
- Controlled excitation (shaker)
- Operational Modal Analysis (OMA)
- Operational Deflection Shape (ODS)

SINT Technology can determine the main modal parameters:

- Natural frequencies
- Mode shapes
- Damping

The validation of the modes was done using the following:

- Modal Assurance Criterion (MAC)
- Complexity tools
- Modal Phase Collinearity (MPC)
- Mean Phase Deviation (MPD)
- Phase scatter

Thanks to the best specialized softwares, SINT can carry out the PRE-TEST analysis (in order to chose the best set-up measurement) and the CORRELATION analysis (for the comparison of the Finite element model with the experimental model).
## Standards

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Recognitions

SINT Technology's test laboratory is accredited to standard ISO/IEC 17025:2005 by the Italian accreditation body ACCREDIA with certificate no. 0910

Certification of conformity to the requirements of standard UNI EN ISO 9001