

ACOUSTIC & VIBRATION

Acoustic and vibration metrology are specialized branches of metrology science dedicated to the precise measurement and analysis of sound and vibration phenomena. These disciplines play a critical role in various industries by ensuring that products, systems, and environments meet the required standards for safety, performance, and comfort.



Acoustic & Vibration Measurement

WHAT WE DO

Acoustic Metrology

Acoustic metrology focuses on the measurement of sound, including its intensity, frequency, and propagation. It involves the use of highly sensitive instruments to capture and analyze sound waves in different environments. This branch of metrology is vital in applications such as noise control, sound quality assessment, and the development of acoustic materials.

Accurate acoustic measurements are essential for industries ranging from automotive and aerospace to construction and consumer electronics, where sound levels and quality can significantly impact product performance and user experience.

WHAT WE DO

Vibration Metrology

Vibration metrology, on the other hand, deals with the measurement of mechanical oscillations and vibrations within structures, machines, and systems. These measurements are crucial for monitoring and diagnosing the health and performance of equipment, preventing mechanical failures, and optimizing design processes.

Vibration metrology is extensively used in fields such as manufacturing, automotive, aviation, and energy production, where controlling and reducing vibrations can lead to enhanced reliability, longevity, and safety of mechanical components.

Metrology's Role in Manufacturing

Vibrations and acoustics in manufacturing environments are more than just operational concerns—they are critical factors influencing environmental impact, energy consumption, and overall efficiency. By leveraging advanced metrology services, manufacturers can optimize their processes, reduce costs, and contribute to sustainability.

Key Environmental and Economic Impacts:



Noise Pollution

- **Fact:** Manufacturing is responsible for up to 60% of industrial noise pollution, contributing significantly to environmental and health issues (Source: World Health Organization).
- **Impact:** Noise pollution in factories can increase absenteeism by 15%, costing companies an estimated \$3.2 billion annually in lost productivity. (Source: European Agency for Safety and Health at Work).



Equipment Longevity & Maintenance

- **Fact:** Unmanaged vibrations can reduce the lifespan of industrial equipment by 20-30%, leading to an increase in maintenance costs by 15-25% (Source: Plant Engineering Magazine).
- **Impact:** Effective vibration control can extend equipment lifespan by up to 40%, saving companies millions in replacement and repair costs over time (Source: Machinery Lubrication).

NMS Solutions

Vibration Analysis and Control

Our advanced vibration analysis has reduced downtime by 25% for major clients, enhancing operational efficiency and saving up to \$500,000 annually in maintenance costs (Source: Internal Client Case Studies).

Acoustic Measurement

Noise control measures implemented by our team have improved worker productivity by 20% and reduced absenteeism by 10% in manufacturing plants (Source: Nordic Metrology Science Client Reports).

Predictive Maintenance

Integrating acoustic and vibration monitoring into predictive maintenance programs can reduce unexpected breakdowns by 30% and extend machinery lifespan by up to 50% (Source: Predictive Maintenance World).

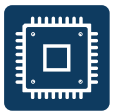
Compliance and Certification

Adherence to noise and vibration regulations has helped our clients avoid potential fines averaging \$100,000 per incident, while also improving their environmental footprint (Source: Environmental Protection Agency).

Metrology's Role in Electronics

In the fast-paced electronics industry, precision and reliability are key to success. Acoustic and vibration metrology are critical in ensuring the performance, longevity, and quality of electronic devices. These measurements not only support the development of innovative products but also help in maintaining manufacturing efficiency and reducing the risk of defects.

Key Environmental and Economic Impacts:



Microelectronics & Vibration Sensitivity

- **Fact:** Microelectronics are highly sensitive to vibrations, with certain components requiring vibration levels as low as 1-2 μg (microgravity) to maintain performance (Source: Electronics Weekly).
- **Impact:** Uncontrolled vibrations can lead to failures in semiconductor manufacturing processes, costing the industry over \$10 billion annually in lost productivity and damaged components (Source: Semiconductor Industry Association).



Consumer Electronics & Vibration Testing

- **Fact:** Consumer electronics, including smartphones and laptops, undergo rigorous vibration testing to simulate real-world conditions. Without proper testing, failure rates can increase by 25% (Source: Consumer Electronics Association).
- **Impact:** Advanced vibration testing can lower failure rates by 30%, improving customer satisfaction and reducing returns (Source: TechInsights).

NMS Solutions

Vibration Analysis and Control

Our vibration control solutions have improved semiconductor yield by 8% in leading fabs, translating to millions in additional revenue per quarter (Source: Internal Client Case Studies).

Acoustic Measurement

Clients using our acoustic measurement systems have reduced PCB defect rates by 18%, leading to significant cost savings and enhanced product quality (Source: Nordic Metrology Science Client Reports).

Predictive Maintenance

Our predictive maintenance solutions, which integrate acoustic and vibration data, have reduced unexpected downtimes by 35% and extended equipment life by 40% (Source: Predictive Maintenance World).

Custom Vibration Testing

By tailoring vibration testing to specific consumer electronics, we've helped clients reduce warranty claims by 25%, improving brand reputation and customer loyalty (Source: Consumer Electronics World).

Metrology's Role in Energy and Utilizes

Acoustic and vibration metrology play a crucial role in ensuring the reliability, safety, and environmental sustainability of energy generation and distribution systems. By accurately measuring and managing these factors, companies can significantly reduce operational risks, enhance performance, and contribute to the global push for greener energy solutions.

Key Environmental and Economic Impacts:



Energy Efficiency

- **Fact:** Proper vibration control in turbines and generators can increase energy efficiency by 2-4%, potentially saving millions of dollars in fuel costs annually (Source: U.S. Department of Energy).
- **Impact:** A 1% improvement in efficiency across global power plants could save up to 80 million metric tons of CO2 emissions each year, equivalent to removing 17 million cars from the road (Source: International Energy Agency).



Equipment Reliability

- **Fact:** Unmonitored vibrations in energy facilities can reduce the lifespan of critical equipment by 15-20%, leading to unplanned maintenance costs that exceed \$2 billion annually worldwide (Source: Electric Power Research Institute).
- **Impact:** Implementing advanced vibration monitoring can extend equipment life by 30%, significantly reducing downtime and saving millions in maintenance expenses (Source: Power Magazine).

NMS Solutions

Vibration Analysis and Control

Our vibration monitoring solutions have reduced unplanned outages by 35% in major power plants, saving clients up to \$1 million per day in potential revenue loss (Source: Internal Client Case Studies).

Acoustic Measurement

By implementing our acoustic control systems, clients in the energy sector have seen a 20% reduction in noise complaints and improved regulatory compliance, avoiding fines averaging \$500,000 per incident.

Predictive Maintenance

Integrating acoustic and vibration data into predictive maintenance strategies has decreased unexpected breakdowns by 40% and extended the lifespan of critical equipment by 50% (Source: Predictive Maintenance World).

Compliance and Certification

Compliance with noise and vibration standards has helped our energy sector clients avoid costly penalties and enhance their environmental reputation, supporting sustainability goals (Source: Environmental Protection Agency).

Metrology's Role in Automotive

The automotive industry demands the highest levels of precision, safety, and durability. Acoustic and vibration metrology play a vital role in ensuring vehicle components meet these stringent standards. From engine performance to passenger comfort, these measurements are integral to producing reliable and high-performing vehicles.

Key Environmental and Economic Impacts:



Passenger Comfort

- **Fact:** NVH levels directly impact consumer satisfaction, with 60% of car buyers considering vehicle quietness as a critical purchasing factor (Source: J.D. Power).
- **Impact:** Effective NVH control can enhance customer satisfaction ratings by 15% and reduce cabin noise levels by up to 5 dB, leading to higher sales and brand loyalty (Source: Automotive Sound & Vibration).



Engine Components & Vibration Analysis

- **Fact:** Vibration-induced wear and tear can reduce the lifespan of engine components by up to 30% (Source: Society of Automotive Engineers).
- **Impact:** Implementing advanced vibration analysis in the design phase can increase engine component longevity by 20%, saving manufacturers millions in warranty claims and recalls (Source: Automotive Engineering Journal).

NMS Solutions

Powertrain Vibration Control

Our powertrain vibration solutions have improved fuel efficiency by 6% in major automotive brands, leading to substantial reductions in CO2 emissions and fuel costs (Source: Internal Client Case Studies).

NVH Optimization

Clients using our NVH optimization services have seen a 20% increase in customer satisfaction scores, contributing to higher brand loyalty and repeat purchases.

Brake System Acoustic

Our acoustic diagnostics have helped manufacturers reduce brake-related warranty claims by 18%, enhancing overall vehicle reliability and customer safety (Source: Automotive Aftermarket Research).

Predictive Maintenance

Integrating acoustic and vibration data into predictive maintenance has reduced unexpected downtimes by 30% and increased production efficiency by 25% in leading automotive plants (Source: Predictive Maintenance Journal).

Metrology's Role in Aviation

The aviation industry operates under some of the most demanding safety and performance standards in the world. Acoustic and vibration metrology are essential tools in ensuring that every component of an aircraft meets the highest levels of reliability and efficiency. From turbine engines to cabin comfort, precise measurement is critical to the success and safety of aviation operations.

Key Environmental and Economic Impacts:



Cabin Noise & Passenger Comfort

- **Fact:** Excessive cabin noise can decrease passenger comfort, with studies showing that noise levels above 85 dB can lead to a 20% reduction in overall passenger satisfaction (Source: Journal of Aircraft Noise and Emissions).
- **Impact:** Effective noise reduction strategies, including precise acoustic measurements, can reduce cabin noise by up to 15 dB, significantly enhancing passenger experience and customer loyalty (Source: Aviation Consumer Reports).



Turbine Engines & Vibration Analysis

- **Fact:** Turbine engine vibrations can lead to premature wear of critical components, increasing the risk of engine failure by up to 40% (Source: Aviation Maintenance Technology).
- **Impact:** Advanced vibration monitoring during manufacturing and maintenance can extend engine life by 25%, reducing the likelihood of in-flight failures and costly repairs (Source: Aircraft Engineering and Aerospace Technology).

NMS Solutions

Engine Vibration Control

Our vibration control solutions have extended turbine engine lifespans by 20% in leading aerospace companies, contributing to safer and more reliable flight operations.

Cabin Acoustic Optimization

Airlines using our acoustic optimization services have seen a 10% increase in passenger satisfaction scores, leading to higher ratings and repeat business (Source: Aviation Customer Experience Studies).

Landing Gear Vibration Analysis

Our landing gear vibration analysis services have reduced incident rates by 25%, enhancing landing safety and reducing repair costs (Source: Aerospace Engineering Review).

Predictive Maintenance

Integrating acoustic and vibration data into predictive maintenance programs has decreased unscheduled maintenance by 35% and improved operational efficiency by 30% in major airlines (Source: Predictive Maintenance in Aviation Journal).



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