Bureau Veritas **Services**

STRUCTURAL AND EQUIPMENT VIBRATION SERVICES

Identification, assessment and management of the risk of structural and equipment failure due to excessive vibration.

BUSINESS CHALLENGE

The integrity of structural and equipment assets plays a key role in the safe and profitable operation of industrial plants. Vibration of structures and equipment can lead to rapid failure due to fatigue especially where structural resonance is involved. Many industrial machines operate at such high frequency that fatigue cycles can accumulate rapidly. These failures will lead to unplanned plant downtime and increased safety risks.

SOLUTION

What are Structural and Equipment Vibration Services?

Vibration services involve the identification, assessment and management of the risk of structural failure due to excessive vibration. An experienced engineer is tasked to investigate the source and transmission of vibration though the structure using state of the art methods in experimental and computational structural dynamics. With the aid of modern simulation methods this investigation is used to recommend modification to structures, equipment or procedures that will increase its service life.

What are the key benefits?

- Comply with statutory duty
- Improve safety and reliability
- Minimise financial liabilities and lost production
- Minimise time detracted from core business

APPROACH

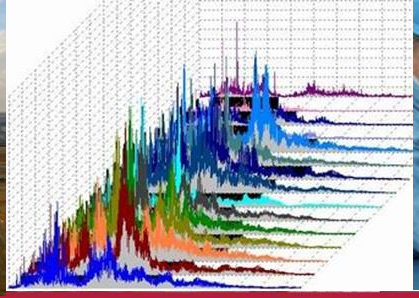
At Bureau Veritas, our tried and tested approach to vibration risk assessment is seen as an essential part of asset integrity management.

Vibration Measurement and Analysis

During the measurement and analysis phase drawings, equipment specifications and site measurements are used to identify the cause of the vibration problem. This knowledge is then combined with predictive techniques to propose a solution.

Typical examples include:

- Vibration measurements of a column in a petrochemical plant clearly showed structural resonance due to wide band random excitation. Simulation, using Structural Dynamic Modification techniques, predicted how this could be reduced through the introduction of damping into the system;
- Vibration measurements on a structure supporting a rotary crusher clearly showed that the unbalance was exciting the structure's resonance frequency. By simply balancing the crusher the excessive vibration could be avoided;
- A Comparison of vibration levels of a large steel structure at an iron ore mine where vibrating

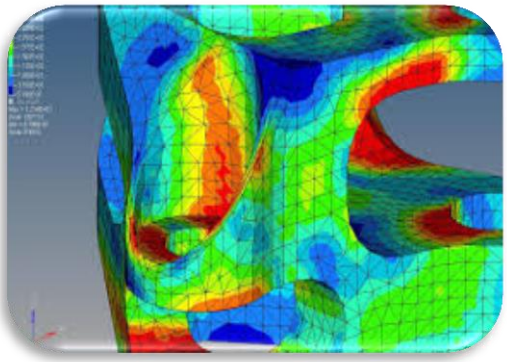




screens are replaced with a new design started with vibration measurements of the supporting structure. The study showed that the new design had significantly lower steady-state vibration levels;
- Verifying the design of packaging to protect sensitive equipment from accidental drops and vibration during transport according to military standard MIL-STD-810F;
- Hand-arm vibration measurements of a pneumatic impact drill in compliance with ISO 5349;
- An Experimental Modal Analysis of a lead plate used to estimate the mechanical properties of the material by comparing the results to a theoretical solution.

Simulation

A wide variety of mathematical techniques can be used to understand the vibration of structures and machines. Methods used for this purpose range from the classical lumped parameter approach to Finite Element Analysis.

Typical examples include:
- The prediction of the natural frequencies of a support structure for a vibrating screen. Typical vibrating screens used in the mining industry operate between 10 and 20 Hz while structures have fundamental frequencies as low as 4 Hz. This makes the design of such structures challenging;
- Predicting the vibration of a skip during filling in an underground mining operation is crucial for the design of chutes to prevent ore falling down the shaft. This system was successfully analysed by including the variable mass and loads from Discrete Element Modelling;
- A printing press foundation is excited by various rotating unbalances operating at different frequencies. The response of the foundation to the excitation was calculated by including the effect of pile-soil interaction and compared the printing press manufacturer's limits.



SERVICES

- Structural vibration acceptance testing
- Experimental Modal Analysis
- Finite Element Analysis
- Structural monitoring for groundborne vibration

RELATED SERVICES

- Failure Analysis;
- Reliability Studies
- Fitness for Service Assessments; and
- Structural Integrity

INDUSTRIES

- Chemical and petrochemical
- Mining
- Oil and gas
- Power and Utilities
- Processing/manufacturing industry

CONTACT

For details about this service, please contact Bureau Veritas:

- Technical Centre Manager
- Office: +27(0) 13 932 5449
- Email: tech.centre@za.bureauveritas.com

FOR MORE INFORMATION

please visit:

- www.bureauveritas.com