Dynamic monitoring of structures

Terratek
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Terratek carries out dynamic loading tests on structures using advanced vibration analysis techniques and state-of-the art electronics. The tests are totally non-destructive and non-intrusive.

The equipment used to take measurements is a very sensitive 24-bit vibration recorder. It is so accurate that is able to measure displacements o the order of magnitude of the wavelength of light. Therefore there is no need to induce artificial vibrations, as we measure the response due to ambient loading like wind, traffic, waves or temperature.

This technology has been successfully applied to many structures, including bridges, steel tower, tall buildings, dams, harbour and offshore structures.

24-bit Vibration recorder

Scope of measurements

The scope of the Pias system is to analyse structural integrity, by checking stresses and strains in the whole structural system, detecting:

- Global structural integrity
- Location and extend of damage;
- Structural behaviour under additional loading;
- Degradation, aging and structural life span.

Small sized vibration recorder

Standards

Measurements and analyses follow the following Standard:

ABNT NBR 15307 Non-destructive testing – Dynamic loading testing on large structures – Procedure

DIN 4150 Erschütterungen im Bauwesen

Projects

Harbour structures, Tubarão Harbour

Offshore structures

Dynamic loading test of jetty and dolphin structure

Conveyor belt and ship loader

200 m high TV tower, Brasília

Safety check of the roof of football stadium

Mosquito Railway Bridge

Bridge integrity assessment

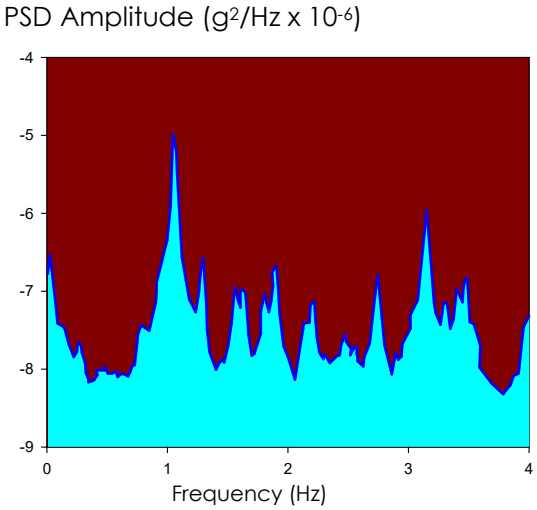
Damage detection on Areal dam

Mining structures: crushers, Mills and scrubber building

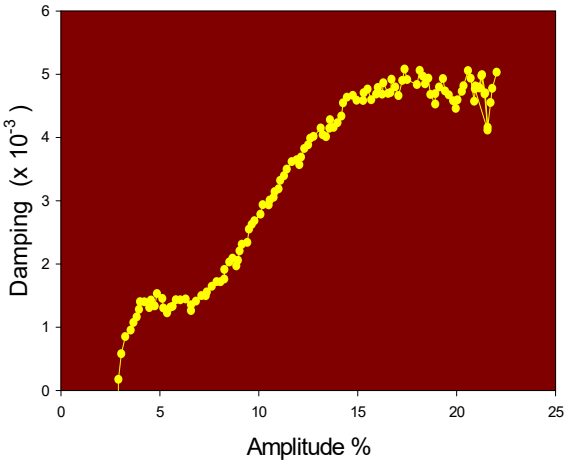
Vibration spectrum and damping

Vibration measurements with time on a structure enable to obtain spectra and damping, by proper mathematical analyses. These data are the backbone for understanding structural behaviour and the effect of damage and aging.

Spectrum



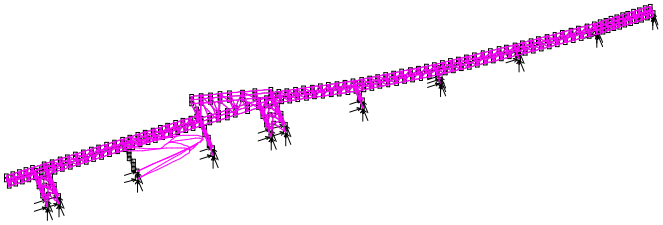
Damping

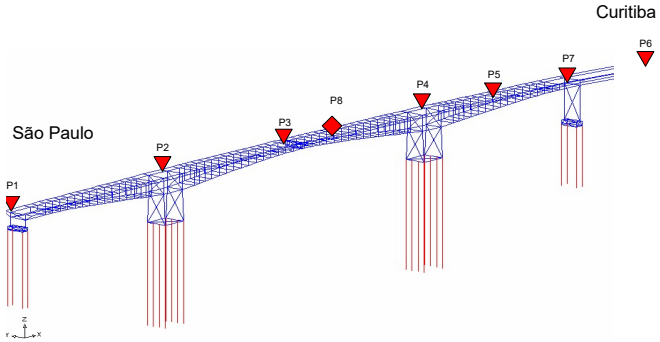


Mathematical modelling

The next step is to build a dynamic mathematical model of the structure through a structural dynamics software. Initially the model outputs the undamaged behaviour. Then, structural damage is simulated on a trial and error process until the structure outputs resonance frequencies that match with the measurements. At this stage the model is calibrated and its behaviour matches the actual structure. Then, the mathematical model can be used to check the behaviour under an type of loading.

Conveyor belt showing dynamic instability on a slender column





Damage detection on highway bridge

Transverse instability during train passage, Mosquito Bridge