AD-SIGNUM™ System

The AD-SIGNUM system provides a simple, cost-effective way to monitor the health of mass concrete, steel-reinforced concrete, and masonry structures. The system is designed to detect changes in the vibrational signature of the structure that indicate the need for inspection and possible remediation.

Operation

The compact, wireless, and self-powered AD-SIGNUM sensor is simple to install. A small solar panel is typically mounted next to the sensor. Each sensor operates autonomously.

The sensor samples structural vibrations continuously and transmits relevant data to a server in a highly compressed form.

The server runs advanced processing algorithms to identify the eigenfrequency signature of the structure. Then it tracks the signature and automatically flags any changes that indicate the need to inspect the structure. Alerts are displayed on screen and can also be sent by text message.
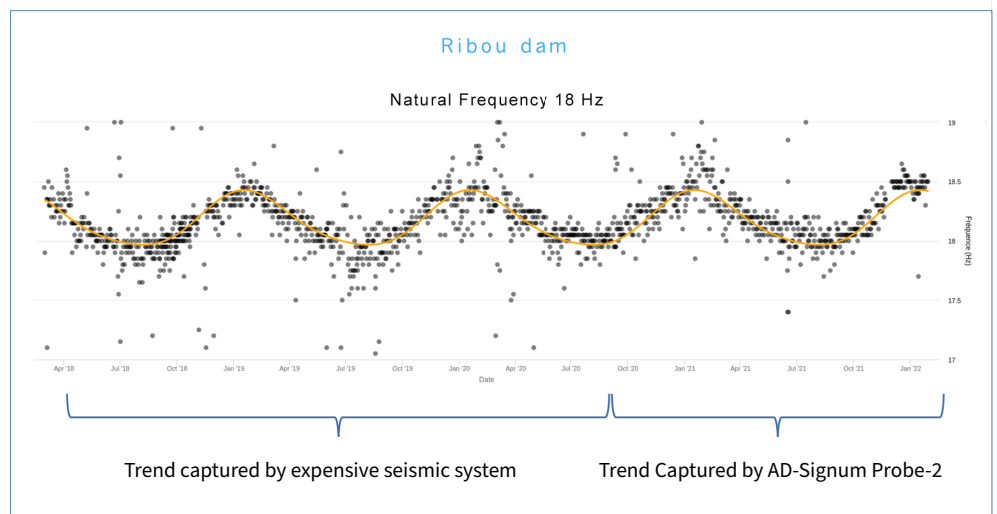
Advantages

Simplicity: The system is designed for damage detection only. It does not attempt to locate, quantify, or trace the evolution of the damage. The focus on damage detection reduces costs and greatly simplifies sensor requirements, sensor placement, and data storage requirements.

Easy Implementation: Sensors are installed on the surface of the structure. The system requires just two weeks of monitoring to identify and begin tracking eigenfrequencies. There is no need for structural modeling, knowledge of excitation, or time-synchronized measurements.

Continuous Monitoring: The system provides daily updates on the health of the structure. This is necessary for early warning of damage and is also useful for prioritizing and scheduling inspections and preventive maintenance, especially when there are multiple structures competing for attention.

The AD-SIGNUM System provides automated asset monitoring for existing structures such as concrete bridges and dams. Sensors are compact, wireless, self-powered, and simple to install.

Ribou dam

Natural Frequency 18 Hz

Trend captured by expensive seismic system   Trend Captured by AD-Signum Probe-2

Application

Early detection and warning of damage or degraded performance of concrete structures. Impact detection is in development. System is not suitable for steel structures.

Sensor Specifications

Internal Sensors: Three high sensitivity, low-noise, coil-type geophones, 1 triaxial MEMS accelerometer, 1 thermistor.

Internal Processor: Microcomputer with high-spec CPU for rapid processing of large volumes of data.

Communications: 4G cellular modem.

Power: Internal battery charged by external solar panel or available external power.

Environmental Limits: IP65, -40 to + 55 C.

Processing

On-Sensor Processing: The microcomputer samples each geophone channel 125 times per second, builds power spectrum densities from Fourier transforms, and then applies patented algorithms to select and compress relevant PSDs for transmission to the remote server.

Server Processing: The server receives and reconstructs the compressed PSDs and applies OMA algorithms to obtain a set of eigenfrequencies.

The eigenfrequencies can be plotted against time to revealing repeating trends. Alerts can be triggered if changes exceed threshold values.