move SOLUTIONS

SMART INFRASTRUCTURE MONITORING

Reduce risks with **Infrastructure** Monitoring

The complete solution for **Static SHM, Dynamic SHM** and **Geo-environmental monitoring**

• Dams • Vertical Structures • Tunnels • Buildings • Dams • Vertical Structures • Tunnels • Buildings • Dams • Vertical Structures • Tunnels • Buildings • Dams

Dam security

Tilt, Deformations, Pressure, Temperature, and Vibrations

Rock face integrity

Deformations, Cracks, Groundwater pressure, and Seismic activity

Ground conditions

Soil movement, Groundwater level, Deformations, Settlement, changes in Pore Pressure, and Soil moisture content

Vibration analysis

Frequencies, Amplitude, Velocity, Acceleration, and Dynamic Displacement

Tunnel Structural Health

Convergence, Longitural Settlement, Deformations, and Cracks

Building stability

Tilt, Settlement, Lateral Displacement, and Foundation soil properties

www.movesolutions.it

✔ Enhance safety ✔ Increase productivity ✔ Improve decision-making

Smart Infrastructure Monitoring with Dynamic and Static Wireless IoT Sensors

TRIAXIAL TILTBEAM

Tunnel convergence

Monitor the convergence of the tunnel to detect any changes in the walls over time and prevent any long-term structural problems.

TRIAXIAL TILTBEAM

Longitudinal stability of the Tunnel

The longitudinal slope is monitored to detect any changes in deformation caused by surrounding ground pressure, traffic loading or temperature fluctuations.

TRIAXIAL VIBROMETER

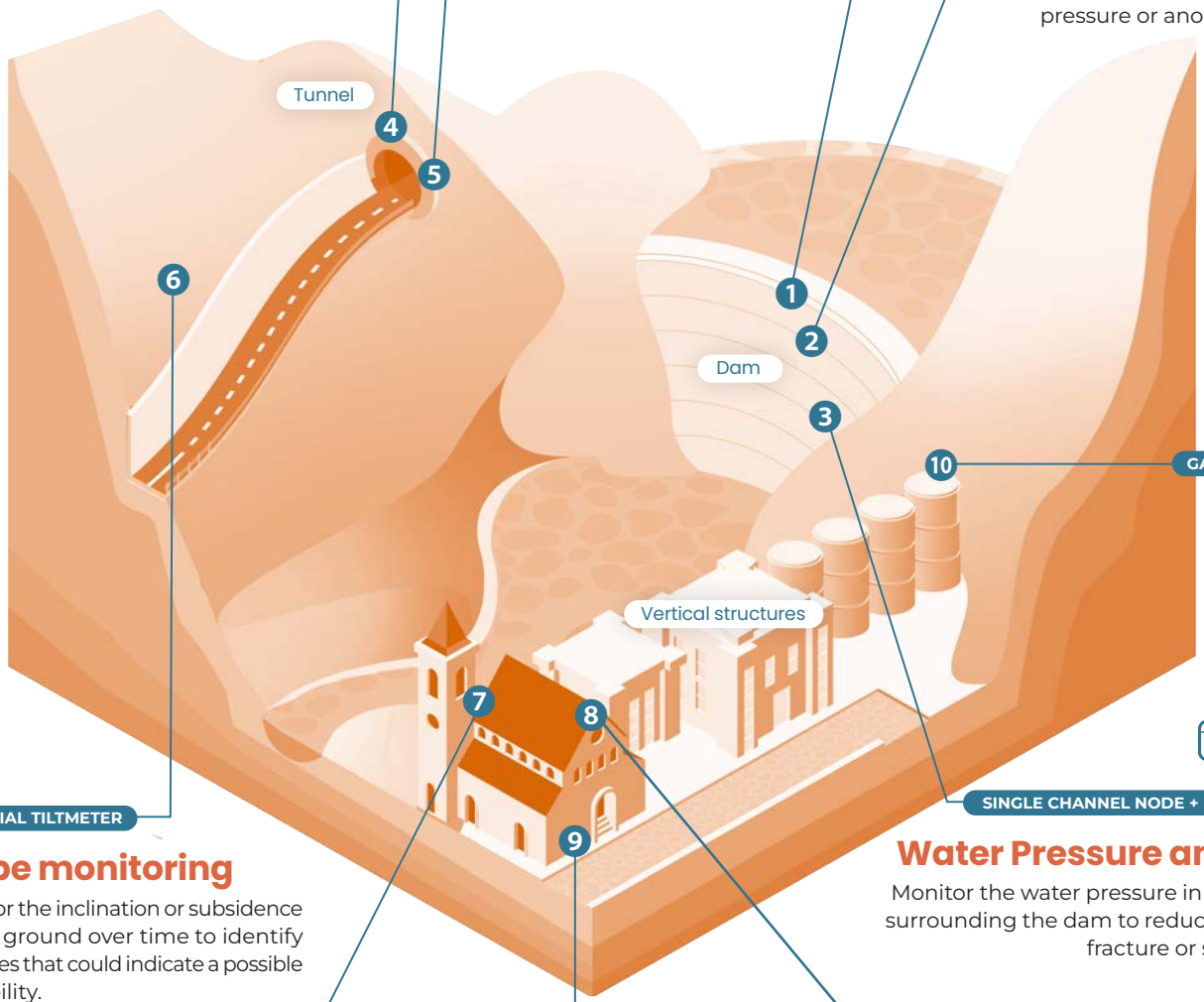
Vibrational analysis

Monitor the speed at which the dam vibrates to identify changes that could indicate structural damage.

TRIAXIAL TILTMETER

Structural stability

Measure the movement of the dam and its stability in response to external forces, such as water pressure or anomal activity.



GATEWAY PRO

TRIAXIAL TILTMETER

Slope monitoring

Monitor the inclination or subsidence of the ground over time to identify changes that could indicate a possible instability.

SINGLE CHANNEL NODE + PIEZOMETER

Water Pressure and level

Monitor the water pressure in the ground surrounding the dam to reduce the risk of fracture or subsidence.

TRIAXIAL VIBROMETER

Vibrational analysis

Measure building vibrations to increase safety and to comply with state regulations on structural monitoring, respecting the required threshold levels and sampling methods.

SINGLE CHANNEL NODE + CRACKMETER

Crack monitoring

Cracks can indicate the presence of structural deformations or movements: their monitoring is important to assess the stability of a building.

ACCELEROMETER SHM

Dynamic analysis

Carry out the Operational Modal Analysis (OMA) of the building by synchronizing accelerometers to identify relevant vibration modes and their evolution over time.

Wireless sensors for infrastructure monitoring

Buildings • Dams • Vertical Structures • Tunnels

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ACCELEROMETER SHM

It measures acceleration (*mg*) and frequency (*Hz*) on three axes, and it can be synchronised to other **accelerometers SHM** for **Modal Analysis**.

1 7

TRIAXIAL VIBROMETER

It measures triaxial vibration parameters, providing a complete analysis of the speed (*mm/s* or *inch/s*), frequency and amplitude of the vibrations to **comply with regulations**.

2 6

TRIAXIAL TILTMETER

It measures triaxial tilt changes, with a resolution of 0.000015° (0.00027 *mm/m*) and the option to be synchronized to other **tiltmeters**.

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SINGLE CHANNEL NODE

It makes **geotechnical and environmental probes** suited for wireless communication, sending alarms when a certain **activation threshold** is exceeded.

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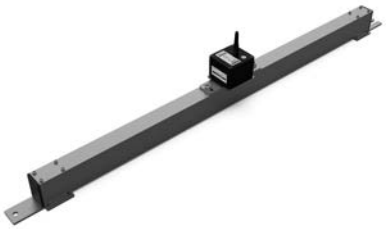
GATEWAY PRO

It acts as an intermediary, using **LoRaWAN** communication to collect data measured by the sensors and transmitting them to the **Cloud Platform** where they can be processed and analyzed.



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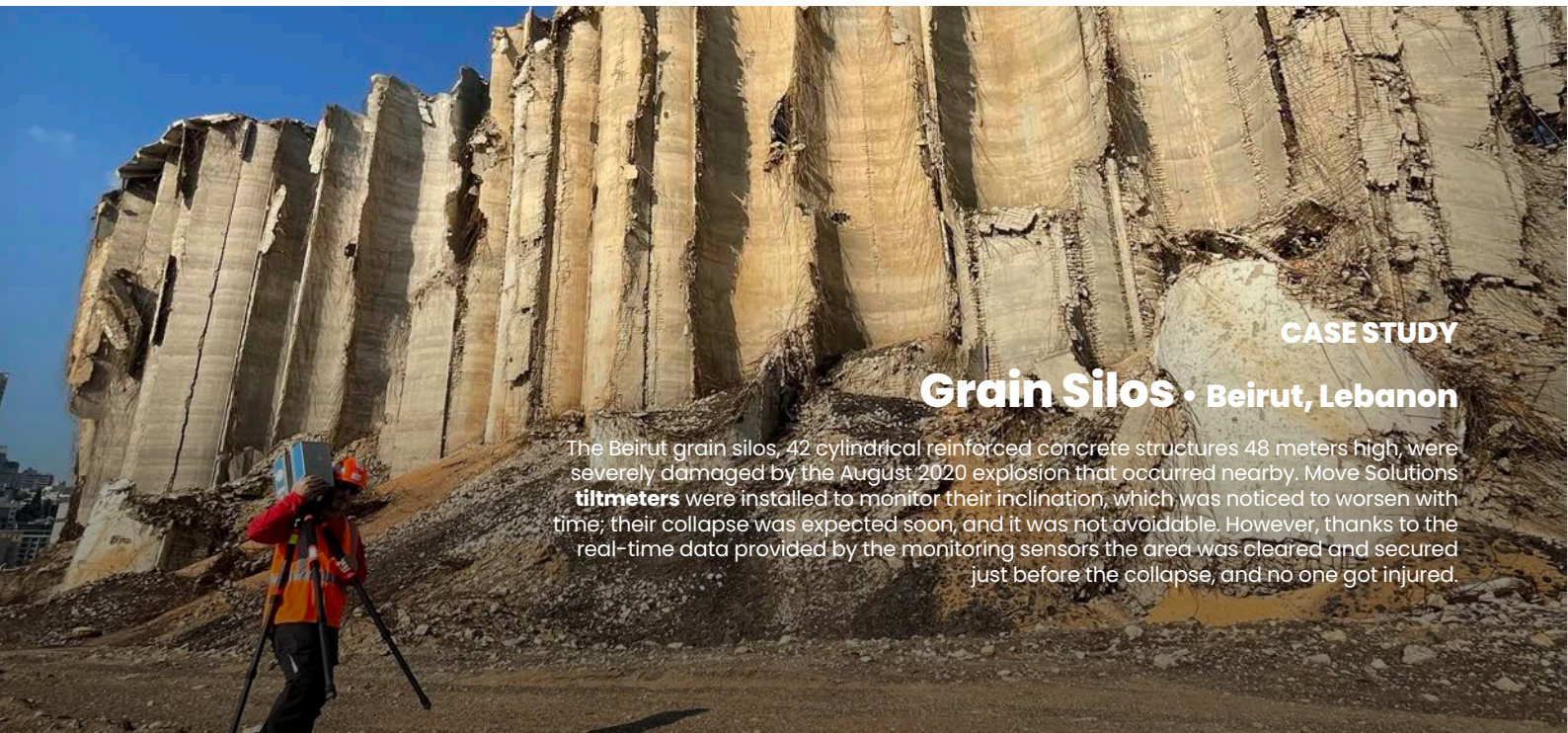
TRIAXIAL TILT-BEAM

It consists of a series of **tiltmeters** attached to a bar, which is then affixed to the structure to measure the degree of slope or tilt over a large area.

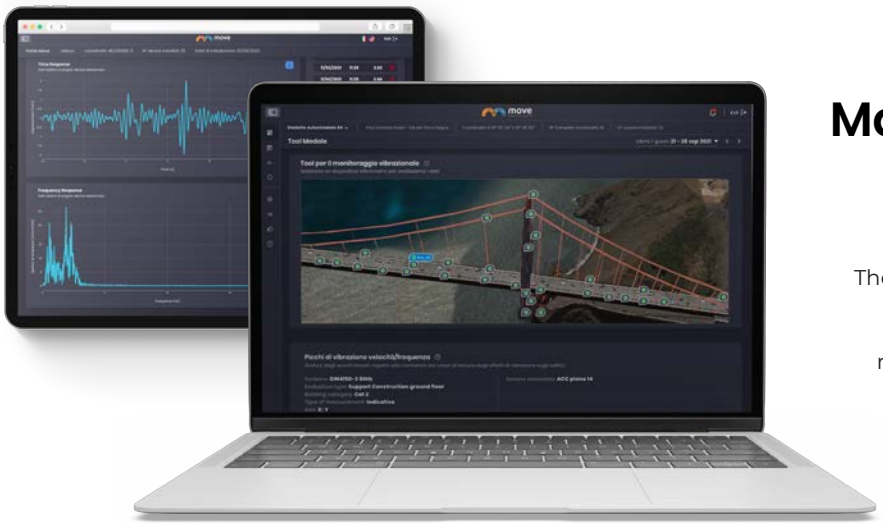
All our sensors are **battery powered** and they also measure **temperature**.



CASE STUDY

Grain Silos • Beirut, Lebanon

The Beirut grain silos, 42 cylindrical reinforced concrete structures 48 meters high, were severely damaged by the August 2020 explosion that occurred nearby. Move Solutions **tiltmeters** were installed to monitor their inclination, which was noticed to worsen with time; their collapse was expected soon, and it was not avoidable. However, thanks to the real-time data provided by the monitoring sensors the area was cleared and secured just before the collapse, and no one got injured.



IoT Data Management
Make decisions based on clear information

The **Move Cloud Platform** offers a single workspace to monitor and manage infrastructure project data. Automate the processing and diagnosis of data by receiving accurate and timely information about the health of a structure.

Modal Frequency Clustering

Modal Frequency Clustering (MFC) displays similar modal frequency clusters in a structure.

Several statistics are provided such as the mean, standard deviation, and percentage change from the mean value of each cluster.

Spectrum Peak Frequency

It refers to the dominant frequency of vibrations detected by a sensor placed on a specific point of the structure. This frequency can be identified by analyzing the vibration signal recorded over time, which is decomposed into spectral components using frequency analysis techniques such as the Fourier transform.

PCPV – Frequency scatterplot

The **PCPV (Peak Component Particle Velocity) / Frequency scatterplot** is a graphical representation of data collected by the three axes of the sensor during a selected time interval. Each amplitude-frequency pair is compared to the alarm threshold selected by the user to establish whether an alarm is triggered or not.

Learn more about all the tools of the **Move Cloud Platform**
www.movesolutions.it

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Smart Structural Health Monitoring
A comprehensive solution

Our Smart Structural Health Monitoring (SHM) system offers a complete solution that helps detect potential issues before they become critical, ensuring the safety and longevity of structures.

Wireless system

Avoid expensive and complex installations thanks to battery-powered, LoRaWAN-based and long-lasting devices.

Remote monitoring

View all sensor-collected data on our Cloud Platform, accessible from any computer at any time.

Threshold setting

Configure sensors according to your needs to receive automated alerts of threshold breaches.

Static SHM

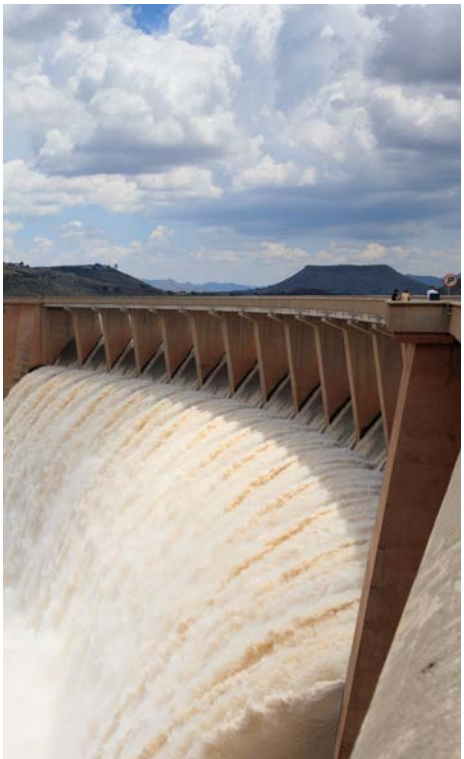
Static structural health monitoring measures slow-varying parameters over a long period of time, such as inclination, rotation, static displacement, and crack monitoring. This type of analysis is appropriate for structures that are subject to gradual load changes.

Dynamic SHM

Dynamic structural health monitoring is used to handle dynamic loading, such as frequencies, dynamic displacement, modal forms, vibrations and accelerations. This type of analysis is suitable for structures subject to fast impacts involving frequencies and vibrations.

Geo-environmental

Geo-environmental monitoring refers to the process of monitoring environmental factors that can impact the stability of a site, such as soil movement, groundwater levels, and changes in the soil's chemical composition.



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