# GEO INSTRUMENTS

Automated vibration monitoring helps prevent property damage and litigation.



Waveform report from pile driving event

#### Why Monitor Vibration

Vibration from construction activities such as blasting, rock excavation, general excavation, pile driving, and tunneling can lead to property damage, litigation, project delays, and increased costs.

## **Basis for Regulator Limits**

Construction activities generate ground vibrations that propagate outward in waves, causing particle motion at the wavefronts. The velocity and frequency of particle motion are the basis for most regulatory limits.

#### Monitoring Equipment: Essential components include a triaxial geophone to sense particle motion; a vibration monitor, also called a seismograph, to record and process signals from the geophone; and software to produce compliance reports.

Additional hardware and services, such as weatherproof enclosures, solar panels, wireless data retrieval, smartphone alerts, and automated reports, can increase the efficiency and reduce the cost of monitoring.

The Monitoring Process: The vibration monitor samples the three channels of the triaxial geophone continuously, checking incoming values against limit thresholds.

At regular intervals, the monitor stores the peak particle velocity (PPV) value for each channel. These values are used to generate a histogram report later. If any incoming value exceeds the limit threshold, the monitor records all of the incoming values for a few seconds. These values are used to generate a waveform report.

**Alerts:** Any exceedance of the limit thresholds should generate an alert so that site engineers can take mitigating actions to bring vibrations within regulatory limits.

**Compliance Reports:** Histograms are used to demonstrate that the site has been actively monitored and that vibration levels have stayed within regulatory limits. Waveform reports show the distribution of velocities and frequencies during exceedance events and are used for further analysis of the events.

### **Advantages of Automation**

- Unattended Monitoring
- Hardware Enhancements
- Automated Data Transfers
- Timely Alerts

**Automated Vibration Monitors** 

- Automated Reports
- Dedicated Website
- Enhanced Safety

**Unattended Monitoring:** Automated systems can record, process, alert, and report without the presence of an operator. This autonomous operation provides significant cost savings.

Hardware Enhancements: Automated systems are supplied in weatherproof enclosures with larger batteries and solar or AC charging. They can stay on site and on line for long periods of time. Manual monitors must be retrieved nightly for protection and battery charging.

Automated Data Transfers: Automated systems send data off site for processing at regular intervals. Manual systems require hands-on data management, which typically delays processing until the end of the day.

**Timely Alerts:** Automated systems send alerts to smartphones and PCs when an exceedance event occurs. They also support on-site alarm units. Manual systems cannot send alerts.

Automated Reports: Automated systems generate compliance reports at specified intervals. This saves time, eliminates complicated workflows, and frees staff for less repetitive work. Reports can be customized to the client's requirements.

**Dedicated Website:** Automated systems store data and reports on a secure server, ensuring that compliance records are safe and complete. Reports are accessed easily by browsing to the password-protected project website.

**Enhanced Safety:** Automated systems provide safe, unattended monitoring in high-risk areas such as tunnels, railways, and crowded construction sites.



#### **Instantel Micromate**

The Instantel Micromate is a good choice if your reporting requirements are inimal and you don't need automation.

Compact and lightweight, the Micromate is also convenient if your monitoring location changes frequently.

The Micromate should be retrieved at the end of the day. You'll need to transfer data to your PC for processing, generate reports, clear the Micromate's memory, and charge the battery.

Monitoring Time: 10 to 15 days of monitoring on rechargeable internal battery.

Dimensions and Weight: 4 x 5.5 x 1.75 in, 1.1 lb.



#### **PVM – Portable & Automated**

The PVM is a good choice if you need protected portability. It is supplied in a strong waterproof case that can be locked, secured, and left on site.

The PVM is available with and without automation services. Automation brings automated data retrieval and website access to automated reports.

With the non-automated PVM, you'll need to transfer data to your PC for processing and generate reports.

**Monitoring Time:** Approximately 5 days, depending on the environment.

Dimensions & Weight: 20 x 15 x 7 in, 26 lb.



#### SVM - Solar & Automated

The SVM is a good choice if you need portability and automation for a longer term. It can be locked, secured, and left on site in a fenced area.

The SVM features a self-standing frame that folds for easy relocation. The solar panel keeps its large battery charged for weeks of automated operation.

All automated systems send data four or five times per day to a dedicated website where reports are generated.

**Monitoring Time:** The battery and solar panel can provide weeks of operation, depending on the environment.

**Dimensions & Weight:** 30 x 18 x 11 in, 80 lb.



AVM - AC or Solar

The AVM is a good choice for long term automated monitoring from a fixed location. Its weatherproof enclosure can be mounted on a wall or pole.

The AC version charges the battery from line power, providing unlimited operating time. The solar version is supplied with a separate solar panel and a larger battery.

**Monitoring Time:** No limit to monitoring when battery is charged by AC line power.

Dimensions & Weight: 20 x 15 x 7 in, 29 lb.



RVM - Rugged & Solar

The RVM is a good choice for long term automated monitoring from a fixed, public location. It features a heavy steel enclosure, a shatterproof solar panel, and high capacity batteries.

The enclosure can be positioned over the installed geophone and its cable to avoid vandalism. The 250 lb enclosure is lockable and easily secured.

**Monitoring Time:** Weeks or months of operation, depending on the environment.

**Dimensions & Weight:** 31 x 21 x 18 in, 250 lb.



**On-Site Alarm Unit** 

Waterproof alarm unit activates a strobe and siren when triggered by the vibration monitor. The alarm unit includes a relay, connecting cable, and magnetic mounting bracket. Other available equipment includes:

- Air-overpressure microphones
- · Sound level sensors
- Specialized geophones
- Accelerometers
- Extension cables