

## **Blast Monitoring - Chore or Helpful Indicator? - Published in the February 2013 edition of Quarry Management.**

It is said that in the 1960s a quarry manager's response to a complaint of vibration might have been to visit the complainant's home just before a blast and theatrically balance a three-penny bit on its edge on the windowsill. If it remained upright after the blast, which it almost always did, the inference was that there were no vibration problems.

Early electro-mechanical seismographs gradually began to appear, complex and difficult to use, with monitoring often being undertaken by independent consultants. By the 1980s digital seismographs had become commonplace. Expensive by today's standards and often big and heavy, they had to be taken to the monitoring location before every blast and set up, waiting to be triggered by the blast.

Results were then printed out by the seismograph's integral printer and the graphical record on the thermal paper was then stored in the blast record book. Now, almost all seismographs are data-logging, connected to a computer after the blast and the results downloaded using the proprietary software supplied by the seismograph manufacturer. The quality of these programs varies from very basic to quite complex and there is also great variation in the ease or difficulty of use.

Since 1975, in the UK, allowable levels of Peak Particle Velocity in mm/s have been gradually reduced from 25mm/s and are now set so low as to totally remove any possibility of even the slightest cosmetic damage. Blast monitoring still has to be carried out but now the emphasis is on reducing annoyance from low level ground-borne vibration and from vibration from air over-pressure.

Studying the quarry's blast records can often point the way to means of improving blast design and reducing vibration and air over-pressure and thus maximising fragmentation and therefore obtaining more value for money from every blast. So, there are advantages to be achieved from carrying out vibration and air over-pressure monitoring although it is time consuming and the operator often has to work in cold and wet conditions.

Technology has moved forwards and now there are seismographs that may be left secured and unattended at the monitoring point with the ability to continuously monitor and upload results to a webpage so that anyone anywhere may, with a username and password, access the results. No software is required, removing the need to master often tricky software installation, difficult RS232/USB connectivity and quirky program applications.

The savings in man hours made by using such a system are huge, especially when taken over a period of a few years. A further advantage is that the archived record may be made instantly available to personnel within the company or the local authority without the need for keeping paper versions.

One such seismograph is the Accudata GVM2 available from Accudata Limited. The GVM2 is one of the most powerful seismographs currently available and packed with features. The GVM2 is highly linear and records in 0.01mm/s increments with readings from a low of 0.03mm/s. The GVM2 supports a combined mode allowing continuous monitoring with a bar-graph record whilst at the

same time having a user defined trigger level that, when exceeded, simultaneously creates a tri-axial waveform event for a number of (user-defined) seconds.

The GVM2 has many options including, an additional tri-axial geophone block, an internal GSM modem module, a printer module, and a LAN module. Alarm functions are also available and include SMS text or e-mail warnings when levels are close to, or exceed user defined levels. The GVM2 also has the ability be controlled and set-up remotely and may be configured to send data to the Internet via a Wi-Fi link.

A further possibility is system leasing, where for a fixed monthly charge, a full wireless- ready seismograph system is supplied and a secure webpage is made available to enable viewing, printing or archiving of the blast events automatically after every blast. The monthly charge includes upgrades, any repairs that may be required and annual calibration.