VIBRATION AND AIR OVER PRESSURE MONITORING

Measurement and Control

TAP Technical Applications Services

Ground vibration is generated from all blasts as a result of the sudden compression of the rock surrounding the blasthole. This results in a powerful compressive wave motion in the surrounding rock that radiates out in a spherical shape from the blasthole. These vibration waves attenuate rapidly as they lose energy at each geological boundary and the energy is spread over a larger and larger surface area until it finally dies out at some distance from the blasthole. Air overpressure is the part of the wave that reaches the atmosphere.

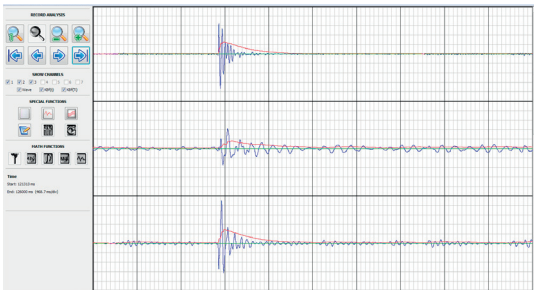
APPLICATIONS

- Open pit mining and quarry
- Civil works, OP and tunelling
- Underground mining
- Underwater blast

BENEFITS

The air blast and vibration monitoring service is a management solution offering blast design and execution supported by sophisticated measurement and statistical modeling techniques that are designed to assist customers make blast design decisions that recognize the likely vibration or air blast impacts for a given point, structure or site.

- Maintain license to operate.
- Preserve mine reputation.
- Reduced mineral loss.
- Minimize costly/inefficient alternative methods of ore extraction.
- Improved community relations.
- Extended mine life in environmentally sensitive areas.
- Increased economy scales and reduced blasting frequency.
- Improved SH&E and loss profile.

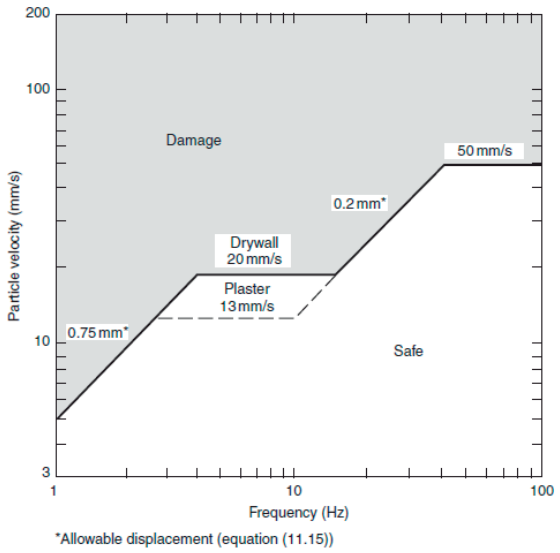


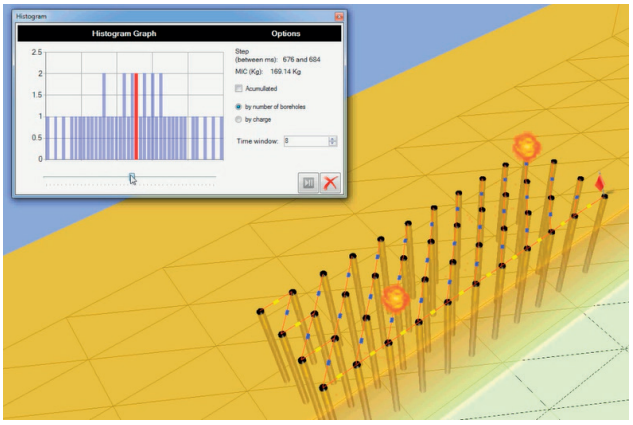
EQUIPMENT

Specific seismographs and microphones are the adequate equipment for monitoring and measuring ground vibrations and air overpressure. Some relevant features of the equipment are:

- Ergonomic and strength in rough conditions. Self-contained and small.
- Peak Particle Velocity (PPV) and Frequency ranges in Blasting levels.
- Communication and wave analysis using PC software.

Properly trained personnel is necessary for this service. MAXAM can provide this personnel or even can provide training





METHODOLOGY

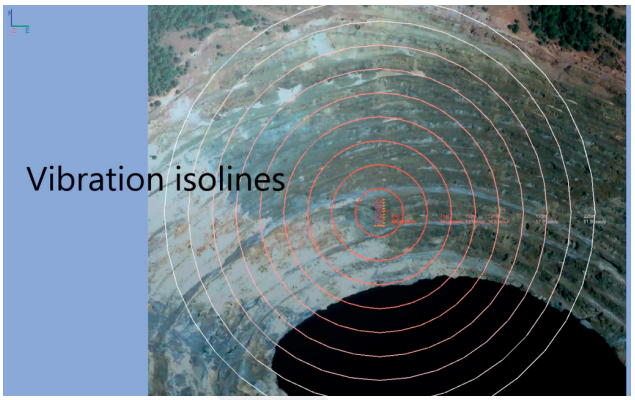
Vibrations and overpressure monitoring consist in the measurement of levels of vibration and pressure generated by one blast and their comparison with standard limits.

One step beyond vibration monitoring vibration analysis, consisting in calculating attenuation formula for a specific blast design and for each rock mass. Methodology is quite complex and consists of:

- Test blast program, shooting a number of single holes and measuring in a number of locations.
- Statistical and empirical simulation (measures and peak values) .
- PPV attenuation formula: V=K Q^α D^(-β)
- Frequency Attenuation formula: F=K D^(-β)
  PPV limits analysis and definition.
- MIC (maximum instantaneous charge) -Distance Table that allows do the blast design assuring that no vibrations are over the limit.

Max. Inst. Charge (kg)	PPV(mm/s)										
25 kg	18.5	13.8	12.2	9.7	7.6	6.1	5.1	4.3	3.2	2.5	2.0
50 kg	32.1	24.0	21.1	16.8	13.2	10.7	8.8	7.5	5.6	4.4	3.5
75 kg	44.3	33.1	29.2	23.2	18.2	14.7	12.2	10.3	7.7	6.0	4.9
100 kg	55.6	41.6	36.7	29.2	22.9	18.5	15.3	13.0	9.7	7.6	6.1
150 kg	76.8	57.5	50.6	40.3	31.6	25.5	21.2	17.9	13.4	10.5	8.5
200 kg	96.6	72.3	63.6	50.7	39.7	32.1	26.6	22.5	16.8	13.2	10.7
250 kg	115.3	86.3	76.0	60.5	47.4	38.3	31.8	26.9	20.1	15.7	12.7
	100 m	120 m	130 m	150 m	175 m	200 m	225 m	250 m	300 m	350 m	400 m

Distance from the Blast (m)



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