Influence of Wind Speed and Direction of Airblast

New Mexico

An airblast study was conducted to determine the effects ambient wind speed and direction on propagation of airblast waves. Airblast from rock blasting is the impulsive pressure generated when energy is released into the atmosphere. There are four generally recognized sources of air blast. Displacement of rock from the free face or mounding at the blasthole collar, air pressure pulse, APP; movement of the ground, rock pressure pulse, RPP; venting of gas through rock fractures, gas release pulse, GRP; and gas escaping caused by stemming ejection or stemming release pulse, SRP.

During the study, 38 individual tests, using Kinestik® as the explosive material, shown on Figure 1, with charges ranging from 0.002 lbs to 2 lbs were monitored using blasting type seismographs. Linear arrays of seismographs were placed down wind, up wind, and cross wind directions and seismograph-to-charge distances ranged from 100 ft to 4251 ft.

Wind speed and direction, as well as temperature were recorded every minute during the tests. Two groups of wind speeds were used for analysis and included gentle wind (speeds of

Fig. 1 Kinestik explosive charges

The following conclusions are drawn from this study:

- Winds blowing in the parallel direction have a resistive affect in the upwind direction and an amplification affect in the down wind directions shown in Figure 2.
- For conditions where the wind directions were parallel to the seismograph array, a higher attenuation was observed in the up wind direction compared with the down wind direction.
- Higher wind speeds (wind conditions) were associated with higher air-overpressures.
- Upwind attenuation of shock wave energy was 33% faster in gentle winds and 20% faster in moderate winds than the down wind direction.

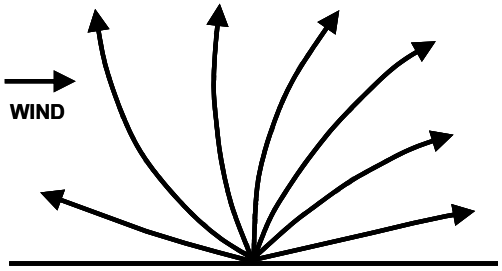

Fig. 2 Wind directional affects on air blast

- As cross winds became more perpendicular to the arrays, the attenuation of shock waves became slower until you reach the downwind position where the attenuation was the slowest.
- For the conditions where the wind direction was not parallel to the array, or cross wind, it was observed that as the angle between wind direction and the array of seismograph increases, the air-overpressure decreases.
- Figure 3 show the attenuation plots with respect to wind direction relative to the array of seismographs at wind speeds between 7 and 16 mph. It is observed that the attenuation slope for the up wind direction is 30% higher then the down wind direction, while the slope for the cross wind is 11% higher than the down wind and 16% lower then the up wind.

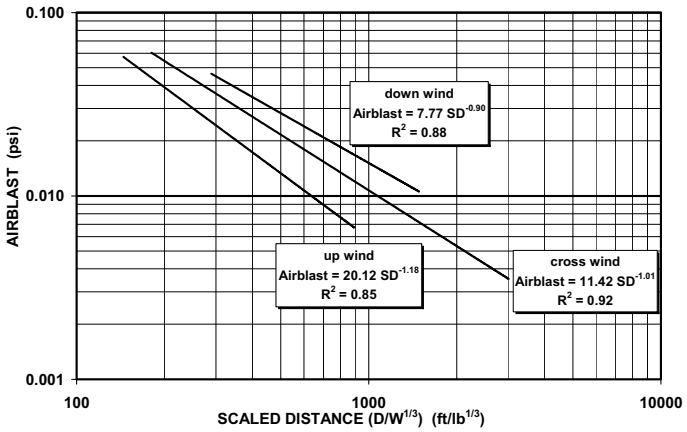

Fig. 3 Airblast attenuation for wind speed between 7 to 16 mph

Acknowledgements

This research is taken from a 2005 MS Thesis, *Atmospheric Airblast Control,* by Farid Sariosseiri, New Mexico Institute of Mining and Technology, Socorro, NM.