AN ANALYSIS OF FIRING TIME S ATTER EFFE TS ON VIBRATION SIMULATIONS FROM WAVEFORMS WITH LOW AND HIGH FREQUEN Y OMPONENTS

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ABSTRACT

Many blasting companies are using simulated production ground vibration waveforms to aid them in the control of their vibration effects. The simulations are typically produced by using a seismograph to record a signature waveform from a single hole shot and subsequently applying the various delays to be used in a proposed production design. The ability of this simulation method to give good results usually depends on three primary factors. These are: 1) the homogeneity of the seismic travel path from hole to hole; 2) the consistency of the seismic energy release per unit of explosive from hole to hole; and 3) whether or not the delays fire as planned.

This paper will deal with the effect of delay accuracy on waveform simulation. A waveform with both low and high frequency components will be used as the basis for an analysis of delay error effects based on multiple delay intervals. Random errors will be assigned to each delay interval over numerous timing calculations to obtain a statistical spread of any significant change in the peak amplitude of the simulated waveform.

The results of these analyses will show that extreme timing accuracy may typically only be necessary for optimal control of the resulting peak vibration amplitude as a function of its frequency. The question is, how much accuracy is necessary? The answer largely depends on the vibration tolerance and the type of shot design. This is not to say that timing accuracy is not important for controlling vibration effects. But rather that when one is not attempting to optimize the reduction of particle velocity amplitude, small timing errors may be either insignificant or potentially beneficial depending on the individual circumstances.