Multiple Hole Configuration Test Shot for Optimum Firing Time and Vibration Prediction

Project Summary

MINE ADVANCE TOWARDS NEIGHBORING HOUSES

A quarry is advancing a bench on the level 3 North Wall towards the edge of the pit and will be blasting the closest distance towards neighboring houses that the mine will get. In order to ensure vibration levels will be below the required level, a detailed Signature Hole Analysis (SHA) was performed on a series of 5 holes with different loading configurations. This will allow the mine to achieve optimum firing times while also building a database for vibration predictions site specific to approaching neighboring houses.

Background

VIBRATION PREDICTION TO AID BLAST DESIGN

The quarry is steadily advancing a bench towards the edge of the pit. As the bench progresses towards the neighboring houses, the quarry wants to ensure vibration levels are below the prescribed limit and that there are no complaints made as the blasting is going to be the closest it will ever get.

To aid in blast design the quarry wants to develop a vibration prediction model specific to the section of the pit advancing towards the neighboring houses.

Project Goals

MULTI-CONFIGURED TEST HOLES

To determine the optimum firing times, a series of test holes were shot with DigiShot® Electronic Initiation system and underwent a Signature Hole Analysis. The DigiShot system allows precision timing programmed to the detonators. The series of test holes were loaded in 5 different configurations to allow a broad range of data for site specific scaled distance vibration predictions. Three holes were loaded as a single column with varying charge weights, and 2 holes were loaded in a decked configuration, top to bottom deck as ¼ ¾, and as ⅓ ⅔ explosive weight.

The 5 different loading configurations allow for a variety of datasets to produce a scaled distance vibration prediction model specifically for the section of the quarry near the residential houses.

Technology Applied

DYNO 42™ VIBRATION CONTROL SOFTWARE UTILIZED TO DETERMINE OPTIMUM FIRING TIMES WITH DIGISHOT ELECTRONIC INITIATION SYSTEM

The test shots were recorded by an array of seismographs. The seismographs were deployed at varying distances inside the pit and outside heading towards the neighboring houses. Data from these seismographs was processed using Dyno 42; a vibration control software program used to derive the optimum firing times for the site specific blast design. Optimum firing times were calculated for the three single column test shots to determine the best delay sequence to promote destructive interference between transient vibration waves radiating from each hole.
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Value Added

IMPROVED VIBRATION AND VIBRATION MODEL IMPROVES FUTURE BLAST DESIGNS

The new timing will aid in reducing vibration levels while approaching the neighboring houses. The added benefit of the DigiShot Electronic Initiation System is the precision timing and increased safety with remote firing capabilities.

In addition, all the seismograph data for each hole configuration was compiled together to create a scaled distance vibration prediction model. This will be useful in future blast design as the bench is advancing towards the residential houses.