GEOHART CONSULTANTS

Geotechnical *(Mining & Civil)*

GEOHART is a Geotechnical Consultancy specialising in the following areas:

- **Underground Mining Rock Mechanics Reviews**
- **Shaft Assessments & Reviews**
- **Rockbolt Integrity Testing and Analysis**
- **Roof Support Assessment & Review**

GEOHART Consultants Pty LTD has been founded and established by Wouter Hartman – Principal Geotechnical Engineer, who has more than 20 years industry experience in exploration, underground and open-cut mining operations, mining and civil tunnelling consulting industries in Australia, Chile, UAE, Dubai, Indonesia and South Africa.

GEOHART is extensively involved in the non-destructive integrity testing of rock reinforcement.

Non-Destructive Rockbolt Testing

The non-destructive rock reinforcement integrity testing analysis is conducted using a complex "Stress Wave Analysis" package based on the processing of clear seismic signals imparted into the rock reinforcement element that is being tested. The seismic signals are processed by "Fourier Transform" into various criteria which can be used to produce models of the element such as mechanical admittance, frequency spectra and velocity which are all being used in the final modelling of the rock reinforcement element under analysis. The current non-destructive integrity testing of rock reinforcement indicated that there is opportunity to further investigate the potential in effectively managing the risk of fall of ground incidents at underground mine and construction sites.

The Mod-Shock System for Mining

This Mod-Shock integrity testing is a "QA" geotechnical risk management tool / test which eliminates good bolts and identifies bolts that may have some deficiency, be it in low load capabilities or loss of cross section of the bolt (e.g. bolt diameter decrease due to corrosion), as the test is cost effective and can test a large population of bolts in a short period of time.

The system has been used for over 15 years in carrying out testing of long length steel rods, either as strand or solid steel bars. The rods were tested and not only were the defective rods identified but it was indicated at what point the rods had lost a large cross section. Hence a background in the successful testing of steel embedded elements with the lengths generally in excess of 5 meters.

Geohart Consultants have tested rock bolts and anchors on more than five projects and have had a good deal of success with the results.

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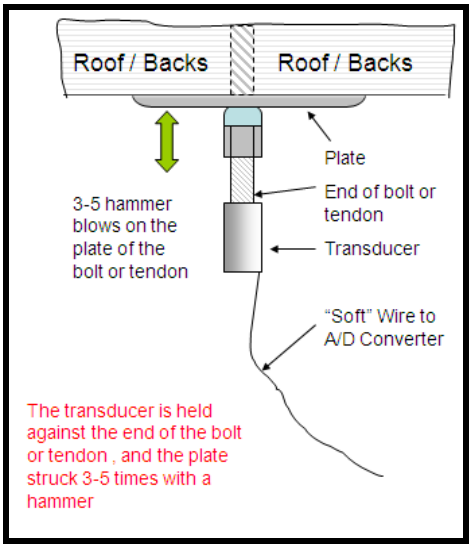
The Test

The test is carried out on site using equipment including notebook computer, A/D converter, transducer and tapping device.

The transducer is held against the bottom of the test bolt, the program informed that a test is about to take place. The plate is struck 3-5 times with a hammer. If satisfactory signal is received by the computer-move to next bolt, otherwise re-test, may take several attempts to get a good signal.

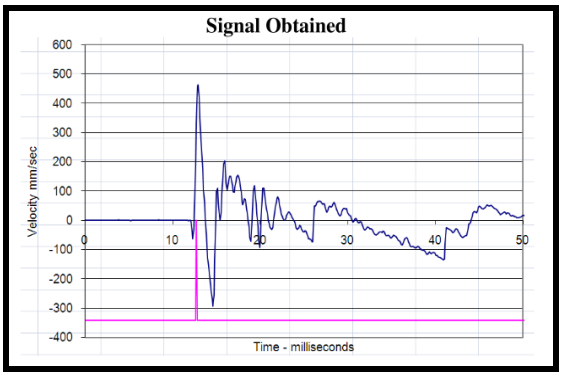


Analysis and Reporting

The operator in the field can at the time of testing identify which bolts are serviceable and then concentrate on the bolts that have anomalies. For the bolts with anomalies a print out of the test can be obtained after the analysis has been carried out. This printout provides a 2D model of the bolt under test and a number of criteria such as the "Stiffness" of the bolt are shown which is compared to two models of fixity of the bolt.

The information is available for further investigation into why the bolt had an anomaly, such as a "low Stiffness" result or large loss of section on the 2D model. One of the vital pieces of information obtained from the Mod-Shock test is the "Head Stiffness" as this is the basis of all the load predictions and it also indicates the serviceability of the total bolt system.

There are variations on the points noted above and categorization of the bolts serviceability needs not only the stiffness to be considered but also the loss of section in the model. The "Stiffness" value of the bolt is a good indicator of the serviceability of the bolt, but cannot be used in its entirety to give a serviceability rating for the bolt, as numerous factors come into play when measuring the stiffness.



Mines where Tests have been conducted;

- **Sunrise Dam Gold Mine, Anglogold Ashanti**
- **Fosterville Gold Mine, Northgate Minerals**
- **Xstrata Zinc – Mt. Isa**
- **Springvale Colliery**
- **North Goonyella**
- **Mandalong Coal**
- **Broadmeadows**
- **Grasstree West**
- **Tahmoor**

For more information please contact:

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