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A Seismic Measurement System for Tunnel Construction

Gerd Sattel
Amberg Messtechnik AG
Regensdorf, Switzerland

William T. Baker
Baker Associates
Ann Arbor, Michigan, USA

Abstract:
The 20 kilometer (km) long Vereina, the 36 km long L6tschberg base and the 57 km long St. Gotthard base tunnels are significant tunneling programs now under construction in Switzerland. Due to the large overburden and the complex geological conditions of the Alps, mechanized tunneling of such a scale requires an exact knowledge of the expected geological conditions ahead of the face.

A measurement system based on seismic reflection technique has been developed as an improvement over time consuming and expensive exploratory drillings. The method is based on the analysis of the echo of reflected sonic signals, i.e. the principle of reflection seismics. Using this method, alterations encountered in the rock mass affecting tunneling ahead of and in the vicinity of face area can be identified and rock-mechanical parameters within the drivage area can be obtained.

The Tunnel Seismic Prediction (TSP0) method was specially designed for use on tunnel construction sites. TSP measurements have a range of 300 feet or more and they do not interfere with tunneling operations. Results typically can be obtained within an hour after measurement. This permits timely changes, such as stabilizing measures of fault zones or adapting the drivage technique, in order to maintain high TBM drivage rates.

Examples are shown of the TSP measurements made in the Vereina and Zugwald tunnels.

Keywords: TSP Method; TSP 202 System; Construction lot T2- Test & Results; Construction lot TS- Test & Results; Cost and time savings through TSP; Cost analysis for a large-scale project.

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