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Rock abrasivity

Due to the advanced mechanisation of the methods of excavation, in particular the increasing use of TBM in underground construction, it is necessary to know the rock abrasivity; indeed it governs strongly the performance of disc cutters, their rate of replacement and therefore the cost of the tunnel.

The Cerchar and LCPC tests are well suited for examining the abrasivity of rocks.

The Cerchar test determines the abrasivity of natural rocks, by measuring the wear on a steel cone, caused by scratching a freshly broken rock surface.
A standardised metal cone under a constant load of 7 kg scratches the rock over a length of 1 cm. This procedure is repeated six times in various directions running against the main structure of the rock, always using a fresh metal tip.
The flattening which occurs during the test phase on the conic metal tip is measured as the diameter of the conic blunt surface. The Cerchar index scale ranges from 0 to 6, one index point corresponds to a conic blunt surface diameter of 0.1 mm.

The L.C.P.C. test consists in rotating a metal propeller at a speed of 4500 rpm during 5 minutes in the sample material. The material is crushed in advance and then sieved to obtain a 500 g sample of the desired fraction of the 4 to 6.3 mm.
The standardised metal hardness of the test propeller is given as Rockwell B 60-75.

The coefficient ABR [g/t] is calculated in g of loss in weight of the metal test propeller per t of sample material. The LCPC coefficient is extremely low for soft, slightly abrasive rock and amounts to more than 1500 g/t for very hard and abrasive rock.

The breakability of the sample material is defined as the weight of fines (<1.6 mm) produced as a percentage of the weight of the starting material.
This index varies from 0 for very hard rocks to 100 for rocks of poor strength.

Carried out in collaboration with Geotest on forty samples of various sites, this study has shown a fairly good correlation between the two test methods (fig. 1).

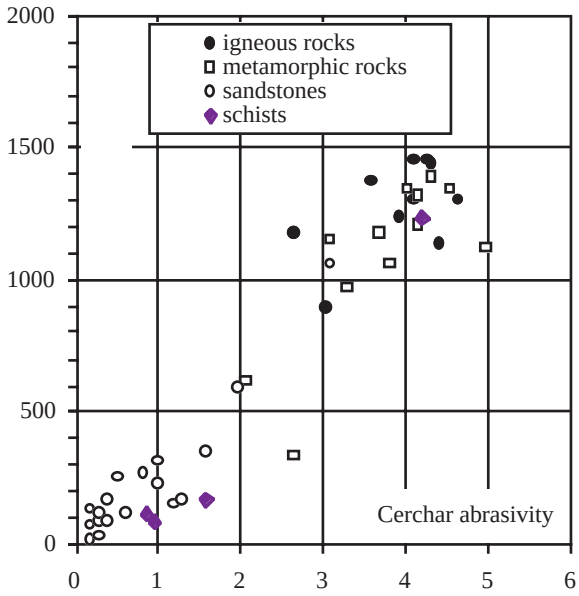

Fig. 1 Cerchar and LCPC indexes in comparison

Publications

Büchi E., Mathier J.-F., Wyss Ch., 1995. Rock abrasivity - a significant cost factor for mechanical tunnelling in loose and hard rock. *Tunnel 5/95,* Cologne: 38-44