An Experimental Study to Measure Grout Penetrability, Improve the Grout Spread, and Evaluate the Real Time Grouting Control Theory

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Abstract

Due to the significant influence of the grout penetrability properties on spread of grout in rock fractures, this study aimed to investigate the grout penetrability from four different aspects. In Part (a), after review of all the existing methodologies developed to measure the grout penetrability, Filter-pump and Penetrability-meter were examined against Short-slot to figure out which one is more reliable. The study decisively considered Short-slot more reliable. In part (b), the so-called varying aperture long slot (VALS), an artificial fracture with apertures of 230-10 μm, was developed to study the gout penetrability more realistically. In part (c), a low-frequency rectangular pressure impulse was introduced to improve the grout spread by successive erosion of the produced filter cakes in consecutive cycles. The results showed considerable improvement in experiments using Short-slot. The dissipation of the pressure impulses was then investigated using VALS with noticeable remaining amplitudes after 2.0-2.7 m. In part (d), VALS was once more introduced to examine RTGC theory in a fracture with variable aperture. The study showed a relatively satisfactory agreement between the experimental results and the predictions of the grout propagation using the hydraulic aperture, whereas the predictions using the mean physical aperture showed considerably faster spread.