CHALMERS

Grouting with gelling liquids

The research aims to find suitable methods for sealing of rock in underground constructions. This involves understanding of the need to seal narrow fractures as well how different methods can be applied. The project is strongly connected to the industry via the financial support.

The use of resins and polymers is nowadays nearly forbidden in underground construction work. They exhibited a good sealing capability for even narrow fractures. The development of new and environmental sounding materials is an important issue today. The research within this project aims studying gelling liquids and especially silica sol.

With thanks to the financial support three field studies has been conducted:

I. Field study in Hallandsåsen, 2003. Silica sol was used to grout the already cement grouted rock mass. Verification of sealing affect and penetration length was done with use of a split-spacing method.

II. A field study in Äspö HRL was conducted in 2004. The expected penetration length of silica sol was based on hydraulic properties of the rock and models describing the flow of grout. The verification of the penetration length was developed.

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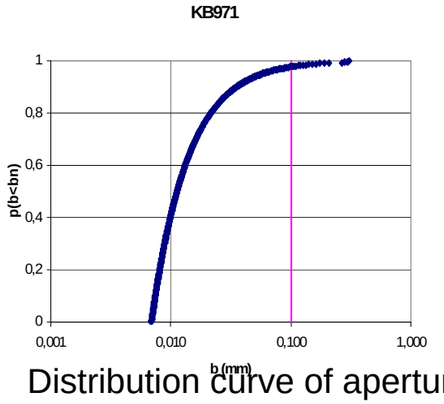
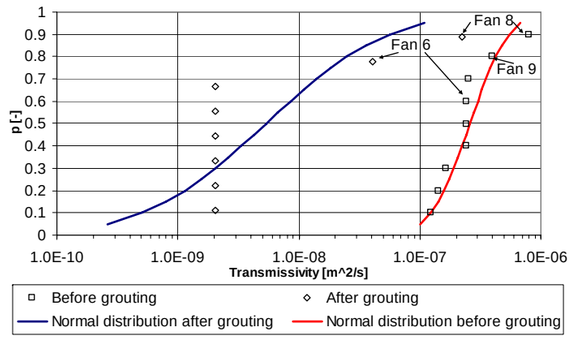
III. A large pre-grouting test was done in the Törnskog Tunnel, Sollentuna in 2005. The initiative was taken by the National road administration, AB Besab and Oden Anläggningsentreprenad. From the evaluations of the apertures present in the rock mass it was calculated that fractures down 0.014 mm had to be sealed to cope with the demands. The theories for penetration length was translated to work in a more practical way. A new concept of an effective grouting time was introduced. Eight of totally nine grout fans worked well. The practical result from this field study was that much less drainage equipment had to be installed, saving a lot money. More effort needs to be considered on the grouting procedure itself.



Distribution curve of apertures in the fractured zone



All nine grout fans, before and after grouting with silica sol