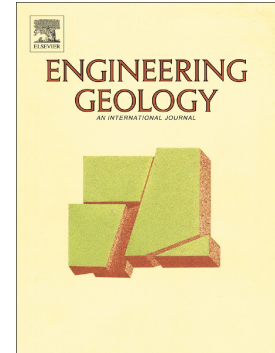


Accepted Manuscript

Prediction of cementitious grout take for a mine shaft permeation by adaptive neuro-fuzzy inference system and multiple regression

İbrahim Ferid Öge

PII: S0013-7952(17)30167-9
DOI: doi: [10.1016/j.enggeo.2017.08.013](https://doi.org/10.1016/j.enggeo.2017.08.013)
Reference: ENGEO 4622
To appear in: *Engineering Geology*
Received date: 31 January 2017
Revised date: 9 August 2017
Accepted date: 10 August 2017



Please cite this article as: İbrahim Ferid Öge , Prediction of cementitious grout take for a mine shaft permeation by adaptive neuro-fuzzy inference system and multiple regression. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Enggeo(2017), doi: [10.1016/j.enggeo.2017.08.013](https://doi.org/10.1016/j.enggeo.2017.08.013)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Prediction of cementitious grout take for a mine shaft permeation by adaptive neuro-fuzzy inference system and multiple regression

Ibrahim Ferid Öge¹

(1) Corresponding author

Muğla Sıtkı Koçman University

Faculty of Engineering, Department of Mining Engineering

48000 Kötekli/Muğla/Turkey

e-mail: feridoge@mu.edu.tr

phone: +90 252 211 2208

Abstract

Cement grouting is a common technique implemented for permeation and ground improvement in civil and mining engineering projects. Basically, it is the injection of cement and water mixture into a fractured rock mass. Due to the presence of water bearing and permeable rock mass, permeation grouting was applied prior to the shaft sinking operation in an underground mine, located in Soma coal basin, Turkey. The Drill-Grout-Drill (DGD) method was used in permeation grouting for a flood prone mine shaft project with a circular pattern covering the proposed shaft opening. Data collection was mainly based on recording borehole data, however, during shaft sinking, field observations were continued to check and validate data, especially the rock mass properties. Widely used classification systems, such as RQD and RMR discontinuity condition rating were selected to define rock mass parameters. The rock mass parameters and the grout take data were pre-processed and cleaned to be used as input for multiple regression modelling and Adaptive Neuro Fuzzy Inference System (ANFIS). Linear, nonlinear, and Box-Cox multiple regression models provided accurate results. ANFIS with subtractive clustering and with manual dictations resulted in improved predictions compared to the regression analysis. Since grouting has great complexity and dependence on numerous variables, particular limitations and omissions had to be defined within the scope of the research. All influential factors could not be interpreted. The methodology and variable conditions are the main novelties of this study and enhance the implementation of the method specifically in the mine project where the study was carried out.

Keywords: grouting, grout take, rock mass, ANFIS, nonlinear multiple regression

1. Introduction

Groundwater control plays an essential role in engineered structures both underground and on the surface since it has direct effects on stability, operations, and safety. In a rock mass, discontinuities constitute pathways for groundwater to flow inside the underground opening (Zimmerman and Bodvarsson, 1996). Water tightness is necessary for several surface structures, such as dam foundations (Karagüzel and Kılıç, 2000). In underground works, groundwater presence and behaviour should be investigated to prevent any delay and remove any risk, which endangers the task (Vutukuri and Singh, 1995). Water drainage can be a necessary step for an underground operation, which might add another parameter to the workload and cause additional cost for shaft bottom drainage.

For underground mining operations, shaft sinking is one of the most susceptible operations to flooding. The restricted working environment of the shafts leads to additional complexity during dewatering operations. Due to their vertical structure, intruded water is collected at the shaft bottom where the sinking operations take place. It is possible to find shaft flooding cases worldwide (Shuxun et al., 1986)). In Turkey, partial and complete flood events occurred and most of them were encountered in the carboniferous coal basin, Zonguldak. Dewatering, grouting, and plug

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات