



Analysis of grout pressure in grouting stages of dam structure to achieve optimum pressure

M. Gholamzadeh¹, M. Masoudi², S. Soltani-Mohammadi³

1- M.Sc. Student, Department of Mining Engineering, University of Kashan

2- Ph.D. student, Department of Mining Engineering, University of Kashan

3- Assistant Professor, Department of Mining Engineering, University of Kashan

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ABSTRACT

Various methods provided for reducing the seepage of water from the dam foundation and abutments that the most common techniques is Curtain Grouting. Quality and efficiency of Grouting operation depend on various factors such as absorption, grout properties and grouting Pressure. One of the most effective parameter is the grouting pressure, because of overpressure, causing hydraulic fracturing in rock mass and low Grouting pressure, causing partial stay of the operation and the site is not completely sealed. So far, different comments, equations, tables and charts have been provided to calculate the necessary pressure in grouting operation. In this paper, has been investigate the effect of grouting pressure in difference stag of Seymareh dam. For this purpose, the grouting pressure is Calculated based on the analytical equations and compared with the actual pressures and finally the best Model is selected. The results show that Groundy and Zaruba equations (with horizontal joints) prepare more accurate estimates of the grouting pressure than others. Also, new Equation is developed to calculate of grouting pressure as a function of Lugeon number that is able to calculate the acceptable grout pressure.

KEYWORDS:

Absorption, Cement Grout, Dam Seymareh, Hydraulic Fracture, Pressure Grout, Lugeon Number

* Corresponding Author, Email: mineralprocessing10@gmail.com

1- Brief Introduction

Various methods provided for reducing the seepage of water from the dam foundation and abutments that the most common techniques is Curtain Grout. Quality and efficiency of Grouting operation is depend on various factors such as absorption, grout properties and grouting Pressure. One of the most effective parameter is the cement grouting pressure, because of overpressure, causing hydraulic fracturing in rock mass and low Grouting pressure, causing partial stay of the operation and the site is not completely sealed. To calculate the required pressure grouting, different comments [1-7], equations [8-10], table [10] and charts [7,10] have been provided by different scientists. All this is experimental and may in some cases close to the allowable pressure and in some cases are too far away.

2- METHODOLOGY

In this paper, has been investigate the effect of grouting pressure in grouting boreholes drilled in the site of Seymareh dam. For this purpose, the grouting pressure Calculated based on Groundy, Zaruba, Verfel, Kutzner and Milatwitch equations and compared with the actual pressures recorded at the borehole and Models that have better estimates, are introduced. Seymareh dam and powerhouse was located on the Seymareh river and about 40 km North West darreh shahr of Ilam and 7.5 kilometers from the Cheshmeh Shyryn village and purpose of the construction of Seymareh dam is use the potential power of the Seimareh river. Seymareh dam Designed form a thin arch concrete dam with height of 130 meters above the present bed of the river and about 180 meters of bedrock and the site is located 3 km upstream of the village Talkhab [11].

3- Main Contribution

In this paper, the relationship between Lugeon number and permissible grouting pressure is presented as follows:

$$L_u = 21/6 \times P - 1/44$$

Since the hydraulic fracture in grouting operation is very important and has direct relationship with the amount of the applied pressure, this relationship can be a good criteria for grouting based on Lugeon value. If selected grouting pressure is more than the amount calculated from the relationship, rock mass may be hydraulically fractured and if the pressure is less than the amount calculated, grouting Radius can

be reduced, which led to failure of grouting operation and dam sealing will be incomplete.

4- Simulation Results

By comparing the results of different equations, it was concluded that the Groundy and Zaruba (with horizontal joints) grouting pressure equation give a more accurate estimates and use this equation is recommended to calculate the permissible grouting pressure at other similar sites.

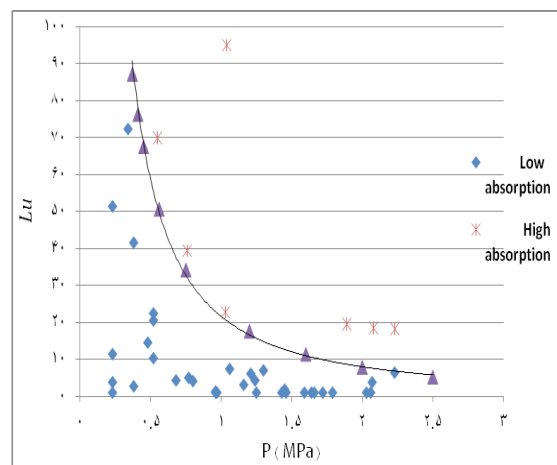


Figure 1. Different stages grouting pressure based on Lugeon number and appropriate curve

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