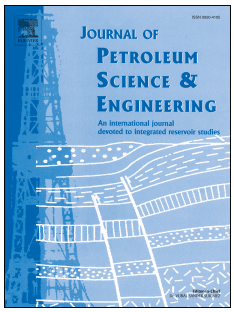
Accepted Manuscript



Quantitative comparison of fifteen rock failure criteria constrained by polyaxial test data

Babak Bahrami, Sajjad Mohsenpour, Mohammad Ali Miri, Ramin Mirsalahi

PII: S0920-4105(17)30759-3

DOI: 10.1016/j.petrol.2017.09.065

Reference: PETROL 4308

To appear in: *Journal of Petroleum Science and Engineering*

Received Date: 11 March 2017

Revised Date: 5 September 2017

Accepted Date: 25 September 2017

Please cite this article as: Bahrami, B., Mohsenpour, S., Miri, M.A., Mirsalahi, R., Quantitative comparison of fifteen rock failure criteria constrained by polyaxial test data, *Journal of Petroleum Science and Engineering* (2017), doi: 10.1016/j.petrol.2017.09.065.

Quantitative Comparison of Fifteen Rock Failure Criteria Constrained by Polyaxial Test Data

Babak Bahrami[1], Sajjad Mohsenpour[1,2*], Mohammad Ali Miri[3], Ramin Mirsalahi[4]

[1]Department of Chemical and Petroleum Engineering, Sharif University of Technology, Tehran, Iran

[2]Chemical Engineering Department, Shiraz University, Shiraz, Iran

[2]Department of Chemical and Petroleum Engineering, Amirkabir University, Tehran, Iran

[3] Azad University of Lamerd, Department of civil engineering

Abstract

Failure criterion is a mathematical relationship with respect to applied stresses on rocks which shows the ultimate strength of rocks. Up until now, different investigations have been devoted for preparation of failure criteria. In this study, grid search and axis changing methods are used to compare various failure criteria for different types of rock with the experimental polyaxial test data. These criteria include; Mohr-Coulomb, Hoek-Brown, Bieniawski-Yudbir, linear, second order and power law form of Mogi 1967, linear, second order and power law form of Mogi 1971, Modified lade, Drucker-Prager, 3D Hoek-Brown, Modified Wiebols and Cook, HBMN and Modified Mohr-Coulomb. Polyaxial data were determined experimentally. The results show that, Mohr-Coulomb, Hoek-Brown and Bieniawski-Yudbir criteria in which intermediate stress is not included on rock failure, have the least accuracy and approximately have the same absolute relative error. Among all the criteria, the Modified Lade results have the best agreement with the experimental data. In particular, the Modified Lade criterion is the best choice for assessing wellbore stability in oil and gas wells drilling industry and mine tunneling.

Keywords: Failure Criteria; Polyaxial test; Well bore stability; Quantitative comparison

1. Introduction

* Corresponding author E-mail: Sajjad_mo2010@yahoo.com