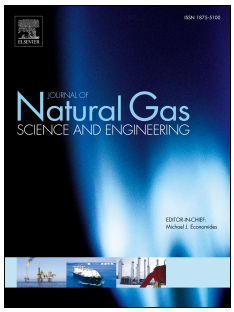
Accepted Manuscript



Quick approximate elastoplastic solutions of wellbore stability problems based on numerical simulation and statistical analysis

Chang Huang, Babak Akbari, Shengli Chen

PII: S1875-5100(18)30009-X

DOI: 10.1016/j.jngse.2018.01.005

Reference: JNGSE 2411

To appear in: *Journal of Natural Gas Science and Engineering*

Received Date: 15 December 2016

Revised Date: 1 December 2017

Accepted Date: 1 January 2018

Please cite this article as: Huang, C., Akbari, B., Chen, S., Quick approximate elastoplastic solutions of wellbore stability problems based on numerical simulation and statistical analysis, *Journal of Natural Gas Science & Engineering* (2018), doi: 10.1016/j.jngse.2018.01.005.

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.

ACCEPTED MANUSCRIPT

Quick Approximate Elastoplastic Solutions of Wellbore Stability Problems Based on Numerical Simulation and Statistical Analysis

Chang Huang*, Babak Akbari, Shengli Chen

Louisiana State University, Baton Rouge, Louisiana 70803, USA

Abstract

Wellbore instability has been a chronic issue for well operators over several decades in petroleum industry. Traditional linear elastic models may sometimes fail to provide a proper mud weight window for drilling engineers. Elastoplastic models can better represent the rock behavior and, therefore, more accurately evaluate the risk of wellbore instability. However, elastoplastic models have failed to gain popularity in the industry because of the model complexity and computation cost. This work proposes an approximating method in a novel manner, incorporating both the validity of the elastoplastic constitutive model and the rapidity of the linear elastic model to predict wellbore behavior. The non-associative strain hardening Drucker-Prager elastoplastic model is used. The relationship between the yielded zone area calculated by the elastoplastic model and the pseudo-yielded zone area calibrated by the linear elastic model is statistically investigated. It is found that the two can be correlated with high confidence based on a set of common input parameters, like in-situ stresses, wellbore pressure, Young's Modulus, etc. Three correlation equations are provided according to the value range of the predicting terms and an application example is addressed at the end. In conclusion, this approach will help engineers make reliable wellbore stability decisions without resorting to sophisticated elastoplastic models. The equations can be directly used in simple spreadsheet functions or real-time data processing schemes to make faster and more efficient decision.

Keywords: Wellbore instability; Elastoplastic model; Approximate solution; Statistical analysis; Normalized yielded zone area;

* Corresponding author.
E-mail address: huangchang73@gmail.com (C. Huang).

Download English Version:

https://daneshyari.com/en/article/8128335

Download Persian Version:

https://daneshyari.com/article/8128335

Daneshyari.com