Accepted Manuscript

Elastic, viscoelastic, and strength properties of Marcellus Shale specimens

Arash Kamali-Asl, Ehsan Ghazanfari, Pania Newell, Mathew Stevens

PII: S0920-4105(18)30474-1

DOI: 10.1016/j.petrol.2018.05.074

Reference: PETROL 5003

To appear in: Journal of Petroleum Science and Engineering

Received Date: 18 January 2018

Revised Date: 2 April 2018
Accepted Date: 28 May 2018

Please cite this article as: Kamali-Asl, A., Ghazanfari, E., Newell, P., Stevens, M., Elastic, viscoelastic, and strength properties of Marcellus Shale specimens, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/j.petrol.2018.05.074.

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

1 Elastic, Viscoelastic, and Strength Properties of Marcellus Shale Specimens

2 Arash Kamali-Asl^a, Ehsan Ghazanfari^b, Pania Newell^c, Mathew Stevens^d

3 ABSTRACT

4

5

6

7

8

9

11

12

13

14

15

16 17

18

19

20

21

Shale gas rocks are characterized as clastic sedimentary rocks, with features such as obvious bedding planes, presence of micro-cracks, and high clay and organic content. These rocks are anisotropic, and inhomogeneous exhibiting a nonlinear response under loading. In order to optimize the required energy for hydraulic fracturing operation and production in shale gas reservoirs, and for constitutive and numerical modeling, it is important to characterize these shale gas rocks. In this study, the hysteresis, elastic-plastic, viscoelastic, and strength properties of Marcellus Shale specimens retrieved from a deep well located in West Virginia were evaluated through perforing a series of creep, cyclic, and triaxial multi-stage failure tests on these specimens. The results suggest that both elastic moduli and plastic deformations show significant levels of pressure depednecy. Moreover, higher creep compliance and lower Young's modulus values were observed for clay-rich specimens. Both Power-Law and Burgers models were found to capture the creep response of these specimens reasonably well. The dynamic moduli estimated from the ultrasonic velocity measurements at different stress levels were found to be higher than static moduli estimations. In addition, the changes in the internal microstructure of the specimens resulted from variations in the stress condition, were found to affect the ultrasonic velocity measurements. The strength properties of the calcite/quartz-rich specimen, using multi-stage triaxial failure test, were estimated through both Mohr-Coulomb and Hoek-Brown failure criteria.

22 **KEYWORDS**

23 Shale gas, failure strength, ultrasonic velocity, creep models, elastic moduli, viscoelastic, cyclic

^aPhD Student, Department of Civil and Environmental Engineering, The University of Vermont, 33 Colchester Ave., Burlington, VT 05404, USA, akamalia@uvm.edu

^bAssistant Professor, Dept. of Civil and Env. Eng., The University of Vermont, Ehsan.Ghazanfari@uvm.edu

^cAssistant Professor, Department of Mechanical Engineering, University of Utah, Pania.Newell@utah.edu

^dUndergraduate Researcher, Dept. of Civil and Env. Eng., The University of Vermont, mpsteven@uvm.edu

Download English Version:

https://daneshyari.com/en/article/8124347

Download Persian Version:

https://daneshyari.com/article/8124347

<u>Daneshyari.com</u>