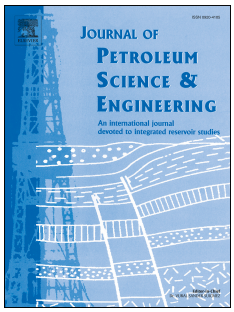
Accepted Manuscript



Investigation on the hydraulic fracture propagation of multilayers-commingled fracturing in coal measures

Haifeng Zhao, Xiaohua Wang, Zhiyuan Liu, Yujie Yan, Haixing Yang

PII: S0920-4105(18)30335-8

DOI: 10.1016/j.petrol.2018.04.028

Reference: PETROL 4880

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

Received Date: 23 October 2017

Revised Date: 8 April 2018

Accepted Date: 12 April 2018

Please cite this article as: Zhao, H., Wang, X., Liu, Z., Yan, Y., Yang, H., Investigation on the hydraulic fracture propagation of multilayers-commingled fracturing in coal measures, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/j.petrol.2018.04.028.

Investigation on the hydraulic fracture propagation of multilayers-commingled fracturing in coal measures

Haifeng Zhao[a,*], Xiaohua Wang[a], Zhiyuan Liu[b], Yujie Yan[b], Haixing Yang[c]

(*a. School of Petroleum Engineering, China University of Petroleum, Beijing 102249, China;*

b. Northwest Oilfield Branch, SINOPEC, Urumchi, Xinjiang 830011, China;

c. Hancheng Branch, Petrochina Coalbed Methane Co., Ltd., Hancheng, Shaanxi 715409, China)

Abstract: Multilayers-commingled fracturing is the vital step to achieve gas co-exploration in coal measures. Hydraulic fracture is required to penetrate vertically through multilayers in Multilayers-commingled fracturing. However, investigation on the propagation of commingled crack in coal measures which is soft-hard interlaced strata is less studied and not well understood. Therefore, based on the rock seepage-stress coupling effect, a three-dimensional (3D) hydraulic fracture model of multilayers-commingled fracturing in coal strata was established in combination with ABAQUS finite element software. The influence of geological factors and construction factors on the hydraulic cracks expansion in sandstone-coal interbedded reservoirs of X well in Linxing area in China was investigated. We found that the minimum horizontal stress difference is an essential geological factor to contain the vertical extension of commingled fractures; The high elastic modulus of neighboring reservoirs promotes the longitudinal penetration of fractures in the multilayers; The low tensile strength contrast between multiple layers increases the possibility of vertical expansion of combined fractures, while the high permeability of adjacent layers restrains the longitudinal propagation of fractures. The critical displacement of fracturing fluid exists in the combined fracturing process. The commingled cracks breakthrough the stratigraphic interface and penetrate into the adjoining layers when reaching the critical displacement; The high-viscosity of fracturing fluid facilitates the extending behaviors of hydraulic cracks in the vertical direction. The research results provide theoretical guidance for optimization of commingled fracturing layers and design of construction parameters in coal strata.

* Corresponding author.
E-mail address: zhaohf@cup.edu.cn (H. Zhao)