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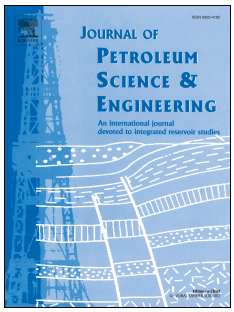

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Wenxiu Dong, Xiaodong Wang, Jiahang Wang

PII: S0920-4105(17)30944-0

DOI: 10.1016/j.petrol.2017.11.062

Reference: PETROL 4478

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

Received Date: 28 February 2017

Revised Date: 15 November 2017

Accepted Date: 23 November 2017

Please cite this article as: Dong, W., Wang, X., Wang, J., A new skin factor model for partially penetrated directionally-drilled wells in anisotropic reservoirs, *Journal of Petroleum Science and Engineering* (2017), doi: 10.1016/j.petrol.2017.11.062.

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ACCEPTED MANUSCRIPT

A New Skin Factor Model for Partially Penetrated Directionally-drilled Wells in Anisotropic Reservoirs

Wenxiu Dong[a,b,c], Xiaodong Wang[a,b,c*], Jiahang Wang[a,b,c]

[a] School of Energy Resources, China University of Geosciences, Beijing 100083, China

[b] Key Laboratory of Marine Reservoir Evolution and Hydrocarbon Enrichment Mechanism，Ministry of Education, China University of Geosciences, Beijing 100083, China

[c] Beijing Key Laboratory of Unconventional Natural Gas Geological Evaluation and Development Engineering, China University of Geosciences, Beijing 100083, China

ABSTRACT

To study the stimulation effect of partially penetrated directionally-drilled wells, the skin factor model for partially penetrated directionally-drilled wells needs to be figured out. Based on the solution of a continuous point source in a laterally infinite reservoir, the solution of partially penetrated directionally-drilled wells in an infinite slab reservoir is obtained by using integral along the directional well. Then by the approximation treatment of large-time pressure solution, a new simplified skin factor model for partially penetrated directionally-drilled wells is obtained. The good agreements with classical result and numerical simulation result validate the solution in this work. According to the new skin factor model, curves of skin factor in terms of several influencing factors, such as inclination angle, well length, formation thickness and reservoir anisotropy factor are presented. Analysis shows that with the increase of inclination angle and relative well length, the skin factor will decrease, but the increase of anisotropy factor causes the skin factor to increase. Besides, the application of how skin factor is used to analyze the stimulation ratio of WPI (well productivity index) is presented. It can be concluded that for a certain reservoir, partially penetrated directionally-drilled wells with large inclination angle and relative well length will have good stimulation effect. Moreover, large vertical permeability is beneficial to the production of partially penetrated directionally-drilled wells.

Key words: skin factor; inclination angle; anisotropy factor; relative well length; stimulation ratio of WPI [1]

[1]*Corresponding author. Address: No.29, Xueyuan Road, Haidian District, Beijing 100083, PR China.
E-mail addresses: wangxd_cugb@126.com

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