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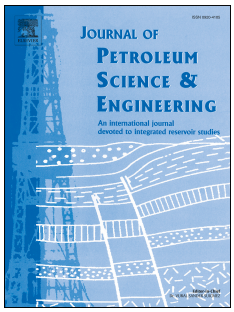

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An evaluation method for friction-reducing performance of hydraulic oscillator

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Abstract: Hydraulic oscillator tool (HOT) is an effective means to solve the problem of over-high drag that encountered in the complex-structure well during sliding drilling. However, when the HOT is utilized in a complex-structure well, engineers still have to face with the following challenges, such as the difficulty in the prediction of drill-string drag, in the evaluation of HOT performance and in the design of HOT position. Therefore, a novel analytical model for predicting the drag of drill-string with an imposed axial vibration was proposed based on the dynamic friction theory, the axial vibration performance of HOT was also involved. The accuracy of the present model was verified by the aid of experimental data of a test well. The influence of HOT's working frequency and amplitude on drill-string axial vibration was obtained, and the vibration transmission range of drill-string with different working frequency and amplitude was also provided. The predicted dynamic drag of test well indicated that HOT can significantly reduce the sliding frictional force between drill-string and borehole rock when drill a long lateral-section horizontal well, the rate of friction-reducing is up to 11.5%. The predicted hook load by using the present model is consistent with the measured data, especially for the HOT working section, and the relative error is less than 10%. The optimized results show that the optimal distance of HOT to the bit is ~180m. The present model is more accurate than the conventional drag model, and it provides a scientific basis for using and optimal design of HOT.

Keywords: hydraulic oscillator; axial vibration; friction coupling; frictional resistance prediction; friction reduction effect

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