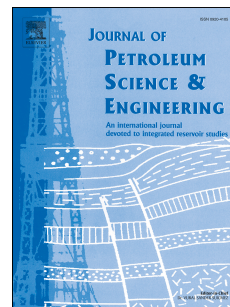


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## Experimental Study on Vibrational Behaviors of Horizontal Drillstring

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**Abstract:** Drillstring vibration is one of the primary causes of drillstring failure, well trajectory deterioration, excessive bit wear and low rate of penetration. In order to obtain an improved understanding of drillstring vibration when drilling horizontal wells, an experimental drillstring system is established in this paper on the basis of drillstring dynamics equations and similarity principle. The system is capable of simulating the nonlinear dynamic behaviors of horizontal drillstring. Axial, lateral and torsional vibration phenomena are investigated in steady state. Experimental results indicate that axial force fluctuates wildly when drillstring is buckled. The fluctuation of WOB (weight on bit) is a typical sine curve and the frequency of WOB increases linearly with rotary speed. The lateral vibration is much more severe than axial vibration for horizontal drillstring. According to similarity principle, in order to reduce lateral vibration, the proposed rotary speed range is 37.5 rpm ~ 50 rpm for the actual horizontal drilling operation. The whirling speed amplitude and frequency of horizontal drillstring increase with rising rotary speed.

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