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Axial Force Transfer of Buckled Drill Pipe in Deviated Wells

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Abstract

Axial force transfer is an issue in deviated wells where friction and buckling phenomenon take place. The general perception of the industry is that once drill pipe exceeds conventional buckling criteria, such as Paslay-Dawson, axial force cannot be transferred down-hole anymore. This paper shows that, even though buckling criteria are exceeded, axial force transfer could be still good if drill pipe is in rotation. On the contrary, there exists sliding operations where lockup is observed, due to buckling, even though standard buckling criteria are not exceeded. This paper is intended to show and explain how axial force is transferred down-hole in many simulated field conditions: sliding, rotating, with or without dog legs. These new results have been obtained from an advanced model dedicated to drill string mechanics successfully validated with laboratory tests.

This paper will show applicable results for practical well operations where axial force transfer is an issue. These results will enable to give some guidelines to help the drilling engineer to select cases where conventional buckling criteria should be used cautiously. Indeed, simultaneous torque-drag-buckling calculations show that tubular can tolerate significant levels of compression, enabling to provide weight transfer to the drill bit, even though drill pipe is buckled. Others examples, in contrast, show that standard buckling criteria cannot predict the occurrence of buckling that may cause tubular lockup while tripping in the hole.

The applications of these results are numerous for all deviated wells such as horizontal or extended reach drilling wells. This paper should contribute to reduce unpredictable lock-up situations and improve axial load transfer performance.

