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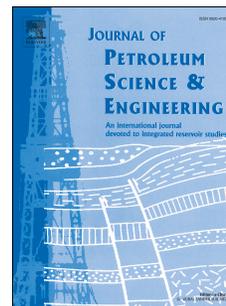
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Study on Aggressively Working Casing String in Extended-Reach Well

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Abstract

Running casing in extended-reach well (ERW) can be extremely difficult because of high drags. Once running casing is hindered by high drags, a special operation, aggressively working casing string, sometimes is employed to help casing overcome the high drags. During this operation, drillers first pick casing string up to a certain height and then slack it off rapidly (or drop it), so that casing string seems to “fall” from that height with relatively high speed. Because of the kinetic energy, casing string is more likely to overcome high drags and reach the target depth (TD). However, the operation also has many uncertainties. For example, whether casing string can really overcome high drags is hard to predict. Moreover, the operation sometimes is violent and may cause safety problems.

To study this operation, a new drag model is built to describe the behavior of casing string during aggressively working string. The model is an improved soft string model which considers dynamic motion of casing. The model is able to calculate forces and motion of casing string in falling process during aggressively working string. Two case studies are presented where casing string was aggressively worked to overcome high drags. Mechanical behavior of casing string in each case is studied and the safety issues are discussed. Finally, suggestions on this operation are also proposed.

Key words: extended-reach well; down hole tubular mechanics; drag & torque; running casing; aggressively working casing string.

1 Introduction

Running a very long casing string in extended-reach well (ERW) sometimes can be very challenging. The failure to make casing reach the target depth (TD) would often lead to significant consequences, such as additional cost, trouble time and, perhaps, abandonment of the end part of horizontal section. Thus, special attention should be paid to running casing in ERW (Mason et al 1999). There have been many techniques facilitating running casing in ERW, for example, casing flotation (Rae et al 2004) and rotation (Webster et al 1987) etc. However, none of them could always ensure a successful casing running process. Moreover, due to the cost of those techniques, conventional casing running method is still predominant today.

When running casing is hindered by high drags, drillers usually circulate drilling fluid. This can help recover some slack-off weight, enabling subsequent casing running operation. However, sometimes even after circulation, casing string still cannot be run normally. In this situation, drillers may try to work casing string aggressively to force casing string to overcome high drags.

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