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Using Aluminum Drill Pipe with Axial Oscillation Tools to Significantly Improve Drilling Performance

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Abstract

Aluminum drill pipe has already been proven as a viable alternative to steel drill pipe when drilling long horizontal wells thanks to its lighter weight that does not compromise resistance to yield and buckling. At the same time, the development of unconventional wells has seen the deployment of numerous technologies to further improve the performance and increase the lateral section to reduce costs. An operator has recently and successfully tested a new aluminum drill pipe with an axial oscillation tool to push further the limits of the drilling system.

This paper presents the key findings of the case study using a mixed aluminum-steel string combined with an axial oscillation tool. First, the innovative drill pipe design is presented, followed by lessons learned during rig operations regarding pipe handling practices, rig compatibility and pipe inspection. Then, results of the drilling simulations performed during the well planning phase are presented. This modeling led to an optimum drill string design associating the steerable mud motor assembly, aluminum drill pipe, axial oscillation tool and steel drill pipe. The number and placement of aluminum drill pipe along the string was key to reducing friction and improving weight transfer between the bit and the axial oscillation tool.

Through extensive modeling and field data interpretation, this paper presents the comparison of the overall drilling performance between steel only and aluminum-steel drill pipe strings, and provides metrics in terms of weight transfer and rate of penetration improvement. This innovative and promising drill string design opens the doors to set new limits in terms of horizontal departure.

Introduction

Aluminum drill pipe has a long history in the industry, although traditionally steel pipe has been the standard material of choice. As the industry begins to find limitations in what it can accomplish with steel, aluminum has seen new popularity as a technique to reduce the total weight of a string for extended reach drilling (ERD) wells¹. The search for technology to extend the reach of drilling beyond current limits has encouraged many companies trying multiple friction reducing methods. Rocking the pipe, axial oscillation tools (AOT) and even mud friction reducers are all tried and true methods for extending the working slide length available