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RSS and Motor Directional Analysis: Modelling the Effect of Local Doglegs on RIH of Completions and Casing

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Abstract

Rotary steerable systems (RSS) and steerable motors pose their own unique challenges when modelling the bottomhole assembly (BHA) directional behavior. This paper aims to present a methodology that allows the anticipation of problems such as mechanically stuck pipe or lock up situations when running in hole casing or completion strings.The methodology consists of 3 tasks: evaluation of intermediate doglegs and wellbore tortuosity using a unique Rock-Bit-BHA analysis, modelling of the casing deformation including potential centralization and then modelling the run in hole (RIH) of the completion. The directional capabilities of a BHA are affected significantly by the selection of the drilling bit, type of directional drilling driving system and the type of formation. The resulting trajectory can be either very smooth or very tortuous with significant additional local doglegs. The deformation of the casing as well as the completion post buckling analysis is completed using a robust and field validated 3D stiff string Torque & Drag & Buckling model. This methodology can be applied before, during or after the well has been drilling. Used before or during the well construction process, an indication can be given as to whether the casing or completion can reach total depth (TD) using planned or actual data. Used after a lockup or stuck pipe incident, the methodology can give an indication if tortuosity was a contributing factor. Various field cases are presented and clearly show the benefit of the methodology including post-analysis of stuck standalone-screen (SAS) completion string in complex 3D drain and pre-analysis of completion run in hole (RIH) targeting a specific drain. Correctly evaluating the risk of BHA, casing and/or completion strings getting stuck or locked-up when RIH can ultimately provide a template for ultimate reduction of non-productive time (NPT).