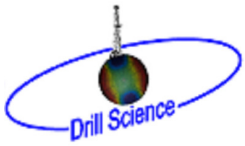

Considerations for Successful Wellbore Trajectory Design

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Introduction

Designing a wellbore trajectory is perhaps a lost art or else an ignored option at times. Do we know as engineers that we don't have to drill a straight hole? Do we know that the fastest way from point A to point B may not be a straight line, nor do we always have to start from A? A wellbore trajectory designed to drill through an accessible section of earth that will optimize stability, cost and risk should always be thought of and if it is possible to reach the target should be chosen.

Abstract

Know that casing wear, and torque and drag (T&D) vary according to dogleg severity (DLS), and hang down force mostly and this means lower kickoff points (KOP) favor lower T&D, casing wear and key seating concerns.
Balance the need for hole trajectory designed for targets, with need for hole stability, hole cleaning, T&D, casing wear, stuck pipe concerns and property/lease rights and rules.
Cost can sometimes mean we kickoff in a section where we can get all of the work done in the fewest number of days rather than be doing directional work over many days in many sections of hole with many tool sizes needing much redressing, transportation and personnel.
Competence of formation. Some formations are easier to do directional work in than others. This might dictate that you can or cannot kickoff at some depth in a well.
Some formations can't build hole angle because the formation is too mushy to hold a side force necessary to kickoff.
Not much vertical depth to target would dictate kicking off as early as possible.
So those are some rationale for KOP determination. My experience is that these reasons are pretty much the same for every basin. The main things that change from basin to basin are depth to targets and the geology and geomechanical peculiarities and complexities.

The key always is BALANCE. Balance the risks. We can never mitigate away risk. Usually one choice lowers one risk and increases another. Analyze the risk, qualify it, quantify it; do this diligently and then balance the risks.

Keep in mind that engineers are paid handsomely to design the weakest structures possible. The strongest structures cost too much and anyone

can simply purchase and build structures with only the strongest materials and designs. It takes an engineer to balance risks. Spending too much money is a risk in the grand scheme and that includes the money of a structure that fails. Of course no one is grand enough to put a cost on human life and must argue with his or her Creator over that risk...

Having a healthy and realistic notion of risks and the ability to diligently balance accurate evaluations is key.