



## **How to Optimize the Inclination-Hold Angle: Based on Formation Fracturing Pressure in Extended Reach Wells [U+FF1F]**

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Under the constrain of the predicted fracturing pressure at the top and bottom of the formation where the open hole section of the extended-reach well (ERW) is placed, a open hole extension length calculation model for ERW is provided based on annular equivalent circulating density (ECD), and the inclination-hold angle of the extension open hole is proposed which provides the basis for ERW path design.

Aiming at the well structure diagram and most common bottom hole assembly of conventional ERW, cuttings bed in the annular space, fluctuating pressure and other factors are all ignored but only formation fracturing pressure is taken as constraint condition for extending limitation, from the aspect of hydraulic, the calculation model of the maximum extended section length is built when the ECD at top and bottom of the extended section are both no more than formation fracturing pressures. Then inclination-hold angle can be obtained through the geometric relationship of the calculated extended length and thickness of the formation.

With the assumption of only drill pipes existing in the bottom hole assembly for the convenience of calculation, then the sensitivity analysis of inclination-hold angle under the hydraulics fracturing constrain of the extended formation is performed with a result of influence rank from flow rate, TVD at the starting point position of inclination-hold section, drilling fluid density, to plastic viscosity, and the study results demonstrate that the inclination-hold angle will decrease with the increase of these parameters. The obtained inclination-hold angle of the extended section according to the determining method mentioned in this paper is a little ideal; the actual result tends to be smaller when taking some influence factors such as restriction of the rated pump pressure and annular cuttings concentration into consideration.

This work is offering a new theoretical method to determine the maximum extended reach length and inclination-hold angle under the hydraulics fracturing constrain of the extended formation, which is very useful for the ERW wellpath designing. By this means, oil companies would make more profits because of the principles that maximizing the reservoir contact (MRC) and improving oil recovery could be put into practice.