Please fill in the name of the event you are preparing this abstract for.	International Petroleum Technology Conference
Please fill in your 5-digit IPTC manuscript number and IPTC Control number.	IPTC-19453-MS 19IPTC-P-1972-IPTC
Please fill in your abstract title.	Fault Slippage Identification and Influence on Casing Deformation for Horizontal Shale Gas Wells Based on Focal Mechanism

Please fill in your author name(s) and company affiliation.

Given Name	Surname	Company
Xueli	Guo	China University of petroleum Beijing
Jun	Li	China University of petroleum Beijing
Gonghui	Liu	Beijing University of Technology

Abstract

During the multi-stage hydra-fracturing process, a large amount of fluid is injected into the wellbore to dramatically increase the pore pressure in the formation, especially in the fault. It was prone that excessive pore pressure can reactivate a natural fault and lead to serious casing deformation. So fault slippage identification and the influence of slippage on casing deformation are critical to guarantee the casing safety.

The micro-seismic signal distribution in a casing deformation point was compared with that of normal places during a fracturing operation. Abnormal magnitude signal and the value of *b* in a G-R formula were obtained by the relationship between magnitude and frequency of micro-seismic. Based on the focal mechanism, the faults slip distance was obtained at the points with abnormal magnitude signals. Then a three dimension stage finite element model was established considering the whole process of drilling, completing, and fracturing operations. The casing stress and displacement were analyzed in different faults angles combined with other factors using the elastoplastic theory.

Research shows that when the micro-seismic distribution was skewed with the borehole and the b-value in the G-R formula was less than 1, the fault slippage occurred. Based on the focal mechanism, slippage distance increased with a higher stress drop, higher moment magnitude, and lower shear modulus. The FEM results were in good agreement with the casing deformation in G115, N201-H1, and W201-H1 wells. When the angle between the fault and the wellbore was 45°, the stress and deformation of the casing reached the maximum. The maximum casing deformation reached up to 35 mm when the slippage distance is 50 mm. Under the condition of fault slippage, the cement sheath elastic modulus, cement sheath thickness and casing thickness were difficult to ensure the safety of the casing.

Casing deformation can be recognized through the feature of micro-seismic distribution during the fracturing operation. A stage finite element model based on focal mechanism provides a new path to know the relationship between natural fault and casing deformation.

Key words: b-value; micro-seismic; casing deformation; hydro-fracturing; fault slippage, focal mechanism, stage finite element model