Innovative Solutions of Casing Deformation Induced by Fault Slip during Hydraulic Fracturing in Shale Gas and Oil Reservoirs: Prediction and Prevention Technology

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Jiawei Cao is a completion engineer in the CNPC Engineering Technology Research Institute Co., Ltd. The topic is "*Innovative Solutions of Casing Deformation Induced by Fault Slip during Hydraulic Fracturing in Shale Gas and Oil Reservoirs: Prediction and Prevention Technology*". His seminar will be at 9:00 a.m. Central time on Thursday, August 21, 2025.

Abstract

Casing deformation caused by fault reactivation during hydraulic fracturing presents significant challenges in China's shale oil and gas operations. While current industry practice relies on passive optimization of fracturing parameters with limited effectiveness, proactive prevention technologies remain underdeveloped. To address the inadequate characterization of minor fractures (≤15m) in conventional seismic interpretation, we developed a multi-source geoengineering data integration methodology. This approach identifies fracture locations by analyzing diagnostic responses in drilling, logging, and mud logging data signatures, achieving accuracy improvement in sub-seismic fracture detection. Concurrently, we engineered an anti-deformation composite casing featuring an expandable rubber outer layer. This proprietary material undergoes controlled hydration-driven expansion during cementing operations, absorbing formation shear displacement to mitigate casing deformation. Field validation in Xinjiang shale oil wells demonstrated

exceptional performance: only 1 of 8 instrumented wells exhibited minor deformation (≤15 mm), confirming the system's preventive capability.

Biography

Jiawei Cao is a completion engineer in the CNPC Engineering Technology Research Institute Co., Ltd. He focuses on the research of shale oil and gas casing deformation prediction and prevention technology and has participated in several field projects in the Xinjiang and Sichuan areas. He has published several technical papers along with more than 10 patents.