

Impact of the Loading Method on Gas Seal Performance of Set Cement

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ABSTRACT

Gas sealing performance of the cement sheath in natural gas wells is very important. Because the cement sheath is subjected to complicated loads during natural gas well production, gas sealing is inevitably affected by such loads and further impacts wellbore integrity. In order to investigate the sealing failure mode of cement sheath under different loading conditions and the influence laws of various factors, the gas sealing performance of set cement under different loading modes was studied on the basis of triaxial cyclic loading tests on set cement while monitoring its permeability and acoustic emission characteristics. Experimental results show that dilatancy damage occurs, and the permeability of set stone increases rapidly with the appearance of dilatancy point during the loading process. When the peak load is higher than the stress on dilatancy point, the cyclic loading-unloading process will seriously damage the set cement, the permeability rises rapidly, and the risk of gas sealing failure increases significantly. The research demonstrates that the gas sealing performance of cement sheath can be improved by enhancing the set cement damage resistance capability.