

Abstract Submitted
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Effects of Rock High Pressure Strength on Penetration HONGFA

HUANG, Schlumberger — Perforating of oil/gas well creates communication tunnel between reservoir and wellbore. Shaped charges are widely used as perforators in oilfield industry. The liners of the charges are mostly made of powder metal to prevent solid slug clogging the entrance hole of well casing or locking the hole in perforating gun. High speed jet from the shaped charge pierces through perforating gun, well fluid, well casing, and then penetrates into reservoir formation. Prediction of jet penetration in reservoir rock is critical in modeling of well production. An analytical penetration model developed for solid rod by Tate and Alekseevskii is applied. However, strength of formation rock at high pressure needs to be measured. Lateral stress gauge measurements in plate impact tests are conducted. Piezoelectric pressure gauges are imbedded in samples to measure the longitudinal and transverse stress. The two stresses provide Hugoniot and material compressive strength. Indiana limestone, a typical rock in perforation testing, is selected as target sample material in the plate impact tests. Since target strength effect on penetration is more significant in late stage of penetration when the strength of material becomes significant compared to the impact pressure, all the impact tests are focused on lower impact pressure up to 9 GPa. The measurements show that the strength increases with impact pressure. The results are applied in the penetration calculations. The final penetration matches testing data very well.

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