

Rock/Fluid Interactions in Unconventional Reservoirs

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Abstract

Water is not inert during hydraulic fracturing; it interacts with the unconventional reservoir rock in many ways. This presentation highlights the various mechanisms of interaction between the hydraulic fracturing fluid and the formation rock. Knowing the impact of the fluid system on the respective reservoir rock, one can design the hydraulic fracturing treatment to optimize hydrocarbon production.

Exploitation of unconventional gas and oil reservoirs requires injecting large quantities of water base fluids during hydraulic fracturing treatments. On average only 5–30 % of treatment, fluids are recovered during flowback from these wells. The large quantity of residual treatment water either remains in the created fracture network or imbibes into the rock matrix immediately surrounding the fracture network. As such, this residual water is spatially located at the critical junction between the reservoir and the hydraulic fracture completion. In addition to potentially causing the loss of relative permeability to hydrocarbons in the matrix rock surrounding the fracture, this residual treatment water disrupts the chemical equilibrium of the rock, hydrocarbon, and connate water system – leading to a physically and chemically altered zone of rock immediately adjacent to the fracture face. Loss of rock strength in the altered zone due to chemo-mechanical effects is a particularly serious problem.