ABSTRACT
The primary purpose of stimulating shale reservoirs is to extend drainage radius by connecting natural fractures, thus maximizing Stimulated Reservoir Volume (SRV). A conventional proppant transport system relies on the viscosity of the fracture fluid to suspend and transport the proppant further into the formation. With the development of unconventional plays, shale gas reservoirs are being treated with slick water type treatments that have inherent low fluid viscosity. Slick water shale fracturing uses proppant transportation that depends on turbulent flow, sand banking and/or bed transport. These result in the majority of the proppant being deposited on the bottom of the created fracture, close to the wellbore, leaving a large portion of the created fracture length unpropped.

In trying to improve proppant transportation, many have focused their efforts on either reducing proppant size or density, both of which will lower proppant settling rates according to Stoke’s Law. However, using smaller proppant sizes or expensive but lower strength lightweight proppants can result in lower fracture conductivities.

This paper examines a new proppant transport method that significantly reduces proppant settling and proppant banking in slick water shale fracturing treatments. This unique technology is based on modifying the surface property of proppant on-the-fly, where micro-bubbles are formed on the surface and around each proppant grain. These micro-bubbles change the buoyancy of the proppant granules. The proppant can therefore be transported in slick water, traveling further distances into the formation without settling, independent of gel viscosity.

Presented experimental data in this study is supported through lab studies, which include conductivity cell, core flow and proppant pack testing. Several tests were performed to examine and illustrate the proppant transport properties of this technology under simulated field conditions. This study also includes reservoir modelling, comparing well productivity with proppant distribution from bed load transport with the new proppant transportation system.

To order the full paper, visit https://doi.org/10.2118/137818-MS