AAPG Datapages/Search and Discovery Article #90254 ©2016, GEO-2016, 12th Middle East Geosciences Conference & Exhibition, Manama, Bahrain, March 7-10, 2016

Challenges in Using Seawater for Fracturing Applications: A Comparison between Seawater-Based and Freshwater-Based Fracturing Fluids using Two Types of Guar Gum Polymers

Maryam Alohaly[1], Ahmed BinGhanim[1], and Raed Rahal[1]

[1]Halliburton

Abstract

During the past few years (i.e., 2006 to 2014), the US revolutionized the development of shale oil and gas by combining two already existing technologies—hydraulic fracturing and horizontal drilling. This helped the US to be almost energy-independent regarding natural gas supply (Charlez 2015). Inspired by such success, the Kingdom of Saudi Arabia and the Middle East region are meeting increasing energy demands by following in the same footsteps (Alexeyenko et al. 2012).

Hydraulic fracturing and horizontal drilling require large quantities of fresh water. The Arabian Peninsula lacks freshwater resources, and those existing resources are currently being consumed by the oil and gas industry in the region. On the other hand, seawater is plentiful and could be used as a substitute for fresh water in unconventional resource operations. However, seawater's high salinity raises many chemical challenges for fracturing fluid design criteria.

To highlight the challenges associated with substituting fresh water with seawater, this paper attempts to study the chemistry of developing seawater-based fracturing fluids using two types of polymers as gelling agents and compares results to already existing freshwater-based fracturing fluids data under different conditions. Various seawaters from around the world were compared to Arabian Gulf water, which varies in composition throughout the year. The local seawater's high total dissolved solids (TDS) (54 000 mg/L) and sulfate content (>4000 mg/L), which caused delayed hydration, alteration of the crosslinking mechanism, and high scale formation, especially barite ($BaSO_4$).