P04

Development of Novel Emulsified Acid using Waste Oil

A.S. Sultan* (King Fahd University of Petroleum & Minerals) & Z. Sidaoui (King Fahd University of Petroleum & Minerals)

SUMMARY

Results showed the potential use of waste oil to prepare high temperature emulsified acid (up to 300°F). The rheological data confirms the stability of the new emulsified formulation at higher temperature. This paper summarizes the findings of using waste oil emulsion and recommends it for field applications. The newly proposed emulsified acid introduces waste oil as replacement of diesel.
Abstract

In carbonate reservoirs, hydrochloric acid (HCl) is commonly used for stimulation purposes. The main disadvantage for using HCl is its high and rapid reactivity allowing for less control on acid reaction with formation. In addition, HCl may react with the tubing causing severe corrosion and damages. Several slow-reacting acid systems, though HCl-based, have been developed to retard the HCl reaction and control its reactivity. Therefore, the emulsified acid can flow deeper inside the formation before it breaks out and reacts with formation rock. However, the selection of the hydrocarbon phase of emulsified acid is critical to the creation and stability of the emulsified acid system. Diesel oil, crude oil and solvents such as xylene have been reported to be successful in the field. In this work, alternative and less expensive source of oil is developed to replace the current practices.

Emulsified acid is a water-in-oil emulsion where oil is the continuous phase and acid is the dispersed phase. Industrial and filtered waste oil was used to prepare the emulsified acid of this work. Extensive work has been carried out to study the chemical composition of the waste oil, and to select the proper emulsifier. Emulsions were prepared using 15% HCl with emulsifier concentration ranging from 0.5 to 2.0 vol% and 70:30 of acid-to-oil ratio. Droplet size distributions were measured and used to benchmark with other emulsions. Emphasis was given to the stability of the emulsion especially at high temperatures (up to 300°F). In order to apprehend the effect of corrosion inhibitor on the emulsion stability, its concentration was varied (up to 0.3%). Later, rheological analyses of the waste oil emulsion were compared to the commonly used diesel-based emulsified acids.

Results showed the potential use of waste oil to prepare high temperature emulsified acid (up to 300°F). The rheological data confirms the stability of the new emulsified formulation at higher temperature. This paper summarizes the findings of using waste oil emulsion and recommends it for field applications. The newly proposed emulsified acid introduces waste oil as replacement of diesel.

**Keywords:** Emulsified Acid, Carbonate Reservoirs, Stimulation, High Temperature, Characterization