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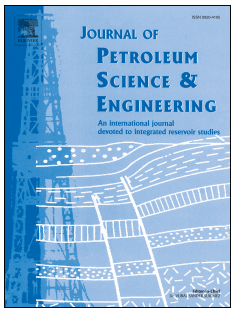

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Geomechanical effects of oilfield chemicals on sand failure in reservoir rocks

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ABSTRACT

Sand failure may result in the production of formation sand at the same time the formation fluids are being produced. This work examines the effects of some commonly used oilfield chemicals, specifically, biocide, corrosion inhibitor and scale inhibitor, on the geomechanical strength of reservoir rocks such as limestone and sandstone. A combination of rock mechanical testing, grain size distribution analysis and analytical techniques are used to establish and define the effects of these chemicals on grain dissolution and unconstrained compressive strength. The results suggest that some interactions such as chemical reaction (dissolution/precipitation) between the oilfield chemicals and the two different types of reservoir formation rocks and transport of grains occurred following the exposure of the rocks to the oilfield chemicals leading to the weakening of the grain fabrics rocks and consequent reduction in unconfined compressive strength. The implications of the results for the strength reduction and sand production are discussed.

Keywords: Sand failure, oilfield chemicals, geomechanical strength, dissolution, mechanical testing, precipitation.

1 INTRODUCTION

Oilfield chemicals have a wide range of applications in oil and gas industry and have been used extensively as inhibitor, surfactant, biocide, stabilizer, depressant, retarder, scavenger, defoamer, demulsifier and stimulant. However, the potential deleterious geomechanical effects of these chemicals on the reservoir formation rock are often not considered by the current industry approach to geomechanical evaluation and prediction of sand failure of reservoir formations that have experienced substantial use of these chemicals. Geomechanical evaluation of the effects of these oilfield chemicals on the properties of the reservoir rock is required in the development of effective sand failure models (Oluyemi et al., 2010). The prediction and prevention of sand production in reservoir rocks has constantly given the oil and gas production engineers concern for decades. This phenomenon occurs when the formation stress exceeds the strength of the formation that is derived majorly from the natural materials that cement the sand grains and bonding by cohesive forces (Oyeneyin et al., 2005). A number of factors, including oilfield chemicals-formation interaction contribute to this phenomenon.

Previous works (Wilson, 2016; Oluyemi, 2014; Mohamed and Nasr-El-Din, 2013; Denney,

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