



Experimental study of iron-control agents selection for high temperature sour gas and oil wells acidizing process

A. Mirvakili^a, M.R. Rahimpour^{a,b,*}, A. Jahanmiri^{a,b}

^a Department of Chemical Engineering, School of Chemical and Petroleum Engineering, Shiraz University, Shiraz 7193616511, Iran

^b Gas Center of Excellence, Shiraz University, Shiraz 7193616511, Iran

ABSTRACT

In acidizing process, the pH of acid increases gradually. When PH is higher than about 2.2, Fe^{3+} forms a black sticky precipitant that decreases well permeability. Therefore, using Ferric ion reducing agent as an additive is a proper way to prevent of precipitant formation. In this study, some materials are introduced as reducing agents and compared with each other. Then the effect of adding catalyst to these materials was investigated and the best mixtures were chosen and compared with commercial ferrotrol 200 from BJ service. These two mixtures include thioglycolic acid as ferric ion reducing agent and potassium iodide as a catalyst, and phosphinic acid salt as ferric ion reducing agent and potassium iodide as a catalyst. The results showed that the proposed additives have better performance at high temperature in contrast to ferrotrol 200. Then these two mixtures and ferrotrol 200 were compared with each other in the presence of H_2S and calcium carbonate (representative of reservoir rock). The result showed that the two chosen mixtures mentioned above have better performances in contrast to ferrotrol 200 owing to better reduction of ferric ion and performing faster than H_2S , also, prevent of FeS and S precipitants formation. After that, a comparison between these two mixtures and ferrotrol 200 has been performed in the presence of crude oil that proved these studied additives do successfully; however, additive including thioglycolic acid is more proper in acidizing process of oil wells.

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1. Introduction

Acid solutions are used to treat oil and gas wells in many ways. For example, acid solutions are commonly injected through the wellbore in to the formation to increase the permeability of the formation and to stimulate production of oil and gas there from (Walter and Walker, 1990). Two basic types of acidizing are characterized through injection rates and pressures. Injection rates below the fracture pressure are termed matrix acidizing, while those above the fracture pressure are termed fracture acidizing. During both acidizing treatments types, the treatment acid dissolves iron scale in pipes and iron-containing minerals in the formation. The dissolved iron normally remains in solution until the acid is spent (Schechter, 1992). Upon spending, ferric hydroxide begins to

precipitate and plug the formation. Complete precipitation of ferric hydroxide is reached at a pH of about 3.2. Ferrous hydroxide, being more soluble, does not begin to precipitate until a pH of approximately 7.7 and is not generally a problem (Crowe and Maddin, 1986). Taylor surveyed the use of iron control chemicals. He concluded that ferric iron would precipitate between pH 1 and 2, in spent acid, not between 2.2 and 3.3 as has been assumed from the solubility product calculations (Taylor et al., 1998, 1999). Taylor presented the sources of iron in the spent acid of acidizing (Taylor et al., 1999; Nasr-El-Din et al., 2007). Acidizing treatments encounter more problems when well is sour. A well is sour when it contains a significant amount of hydrogen sulfide. The combination of sulfide ions from hydrogen sulfide and iron creates additional precipitation problems (Walter and Walker, 1990).

* Corresponding author. Tel.: +98 711 2303071; fax: +98 711 6287294.

E-mail addresses: rahimpour@shirazu.ac.ir, mrhimpour@ucdavis.edu (M.R. Rahimpour).

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¹ Currently on sabbatical at the University of California, Davis, USA.

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