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[PDF (3804K)] [References] [Errata]

Laboratory Investigation on Profile Modification of Oil Reservoir Fluids by Water-insoluble Polymer Producing Microorganism CJF-002

Yuichi Sugai[1], Atsushi Kishita[2], Tetsuya Yumoto[3], Heiji Enomoto[2], Chengxie Hong[4], Kazuhiro Fujiwara[5] and Kenji Ono[6]

1) Graduate School of Engineering, Tohoku University
2) Graduate School of Environmental Studies, Tohoku University
3) Graduate School of Engineering, Tohoku University
4) PetroChina Company Limited, Jilin Oilfield Company
5) Kansai Research Institute
6) Japan National Oil Corporation, Technology Research Center

Abstract: Microbial EOR (MEOR) field test[1~4] was carried out in Fuyu oilfield, China. In this field test, Enterobacter sp. CJF-002[7] which produced insoluble polymer was injected with nutrient, and oil production increased more than twice in volume because the high permeable zones were plugged with the polymer, and the water channeling was reduced[8,9]. Our research group carried out experimental studies to analyze the mechanisms of profile modification by the polymer produced by CJF-002.

Firstly, 10m one-dimensional reservoir model was used for analyzing the polymer production behavior of CJF-002. CJF-002 was injected with nutrient and incubated. After the incubation, water was injected to observe the pressure of every 1m-point. As a result, high differential pressure was observed at the section of 0-1m and 3-4m. That is, CJF-002 produced the polymer at these section more actively. Moreover, it was suggested that a mixture of culture solution and brine improved pH of culture solution, and this improvement reactivated the polymer production of CJF-002 at the middle section (3-4m) and lower section.

Secondly, network model was used for analyzing the effect of the polymer on profile

modification. This model consisted of three 4m-low permeable sand-packs and one 4m-high permeable sand-pack. These sand-packs were reticulately jointed together at every 1m-point. CJF-002 was injected with nutrient from the central inlet and synthetic brine was injected from the other two inlets. Absolute permeability and flow rate of each section were calculated from the pressure observed at every jointing point. As a result, CJF-002 produced a significant amount of polymer in all the high permeable hose and the permeability of high permeable hoses decreased to approximately 1/2 of original permeability. Consequently, the flow rate of high permeable hoses decreased and that of low permeable hoses increased. It showed that the polymer produced by CJF-002 was effective on the profile modification.

Key words: MEOR, Enterobacter, CJF-002, polymer, profile modification, plug, network model, permeability

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