Advancing Recovery by Refining Surfactant Proportion As a Chemical Enhanced Oil Recovery Application

M.J.A.Prince, **Mithilesh Kumar Rajak**, **Venkata Ramana Avula**

Abstract: ***One of the most requesting and promising techniques in Enhanced Oil Recovery (EOR) is the utilization of synthetic compounds to remove extra oil, keeping the ecological concerns and strength of the reservoirs. The objective of this paper is to choose a particular grouping of surfactant that could upgrade Ultralow Interfacial pressure among oil and Water. And, arrangement of smaller scale emulsion through Emulsion Test. The methodology adopted in this work has been done through conductivity estimation of eight diverse surfactant proportions to decide stable Critical Micelle Concentration (CMC). This proportion has been tested with various groupings of electrolyte and alkali for middle layer smaller scale emulsion. Through conductivity test CMC has been resolved at 450 ppm, It has been tried with various concentrations of electrolyte and soluble base for middle layer smaller scale emulsion. Third layer have been noticed at NaCl 1.0 wt% and Alkali 0.5 wt%. At this specific proportion Interfacial Tension (IFT) among Oil and water has been diminished***.

Keywords: Chemical Flooding, Centre layer, Interfacial Tension, Critical micelle concentration

I. INTRODUCTION

A large portion of the Indian fields are developed and the production has crossed its apex level during waterflooding and currently it is at declined state. Innovative work programs on EOR identified with Indian developed fields are required. For the most part, all developed fields in India are possessed by large exploration and production companies were unable to produce economically. Because of complex nature of fields, companies are pulling for progressive joint endeavours however results were not many [1]. In spite of the fact that research centres outcomes guarantee high, while applying in the field, the outcomes are not agreeable at present. The choice of synthetic substances most appropriate in various sorts of reservoirs seeing every reservoir properties like adsorption, wettability and different elements are significant factors [2]. The potential capacity of EOR, to deliver extra oil is compelling, just as costly.

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In most recent five years, the significance of chemical flooding in EOR procedure is multiplying a direct result of its capacity to deliver more oil than some other EOR technique [3]. The IFT diminishes abruptly as surfactant portion increments to CMC reaches. Past the CMC, little change in IFT happens [4].

II. METHODOLOGY

A. Determination of Surfactant proportion

Interfacial Tension is the strain made at interface, where two immiscible liquids are in contact and assumes a noteworthy job in oil recovery process. For sandstone reservoirs, surfactants can diminish IFT among hydrophobic and hydrophilic stages and for carbonate and tight reservoirs it adjusts the wettability [5]. CMC is a factor for surfactant, where Micelles begin to shape at a specific proportion. This demonstrates total partition all things considered and ultralow IFT have been accomplished [6]. IFT will affect surfactant concentration. Ultralow IFT can be accomplished by development of smaller scale emulsions with a middle layer appeared.

B. *Proportionate Alkane Carbon Number (EACN)*

For some random surfactant at whatever point IFT is estimated among water and homologous arrangement of alkanes, a profile can be gotten which looks like that in Fig.3 the most reduced IFT happens with a hydrocarbon having a specific Alkane number which is comparable to a similar Alkane number of surfactant [7].
Coordinating of surfactants, delivering their most minimal interfacial pressure at explicit alkane carbon number with rough oils having a similar Equivalant alkane carbon number (EACN). number is a component of oil stage piece, watery stage organization, surfactant arrangement and focus, cosurfactant structure and fixation, and temperature.
Oil acts during estimation of IFT against watery stages just as they were a homogeneous hydrocarbon with a specific Alkane carbon number (ACN). This carbon number is alluded to as the EACN of the oil.

III. RESULTS

Conductivity estimations, by fluctuating eight surfactant portions have been observed for eight concentrations. Conductivities were estimated each time by expansion of 100 ppm as appeared in Table 1. Deviation has been seen at 450 ppm appeared in Figure 1. Smaller scale emulsion, isolating oil and water as individual stages have been seen at NaCl 1.0 wt% and Na_2CO_3 0.5 wt %. With this Concentrations IFT was estimated by Spinning Drop Tensiometer to be 10^{-3} dynes/cm.

Table 1: Conductivity versus Concentration

SDSppm	Conductivity mS/cm
100	10
200	17
300	24
400	30
500	30
600	31
700	32
800	33

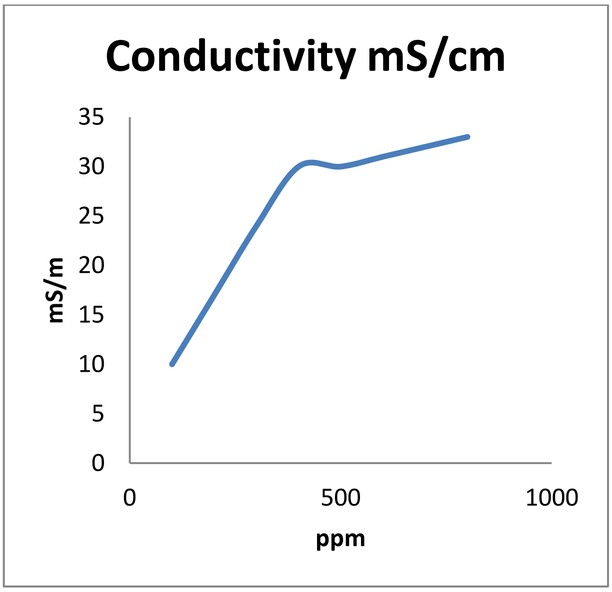

Figure 1. Plot of Conductivity against surfactant concentration and the CMC indication at the graph deviation

Seven mixes of emulsions with 450 ppm SDS in 25ml test cylinders have been tried with Oil, saline solution and antacid as appeared in table 2.

Table 2: Seven emulsions were prepared with keeping surfactant concentration as 450 ppm and altering other compounds.

NaCl wt%	Na_2CO_3 wt%	Appearance in layers
0.0	0.0	1 phase
0.5	0.0	2 phases
1.0	0.0	2 phases
0.0	0.5	2 phases
0.0	1.0	2 phases
1.0	0.5	3 microemulsion
0.5	1.0	2 phases

Figure 2: All the test tubes with different combination of chemicals. But no result was observed at initial stage

Figure 3: All the test tubes with different combination of chemicals. Change occurred in each test tube after 3 days of isolation.

In Figure 2. The 30 ml test tubes were filled with oil and other proportionate chemical and kept at room termperature for three days. During this time oil and water has to be separated according to the surfactant, which acts as as a deemulsifier. Center layer have been seen at after three days at the concentration at 1.0 wt% NaCl and 0.5 wt% Alkali shown in Figure 3. The presence of third center layer is because of microemulsion arrangement. At 450 ppm, SDS shaped micelles with watery and Organic stages by lessening IFT to ideal level. This isolates Oil and water into individual stages and structures three layers.

IV. CONCLUSIONS

Oil recovery could be improved by Reducing IFT. Ultralow IFT can be accomplished by choosing legitimate surfactant proportion. Surfactants have been demonstrated to be successful in recouping unswept oil by decreasing leftover oil immersion. Surfactants are expensive contrasted with other Chemicals utilized in EOR process. Financially, effective surfactants must be generated.

Research must be done on surfactant adsorption to various reservoir surfaces.

Current work is limited to sandstone reservoir and it can be extended to other potential oil recovery reservoirs like carbonate and shales. There is an important factors like wettability which has to be considered for chemical application.

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Dr. M.J.A.Prince working as Assistant professor in the Dept. of Petroleum Engineering., Amet University for the last 8 years. He completed PhD suceesfully in the major of chemical application in oil and gas industry. He was specialized in reservoir engineering. He had been teaching for reservoir engineering, modelling, simulation, enhanced oil recovery and well testing for UG and PG course. Besides, teaching he had published technical articles in peer reviewed journals and in international conferences. His major interest was doing research on application of surfactants and polymers under Enhanced oil recovery projects, Developing working models with forming a team and guiding student projects.

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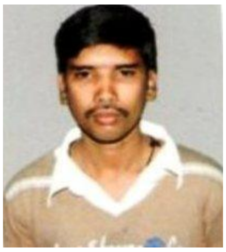

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