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Study of Oil Recovery Method through Chemical Injection in order to Improve Oil Exploitation

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Abstract

Today, the primary recovery of hydrocarbon reservoirs producing oil fields in the world due to natural The mechanism is done. But over the lifetime of reservoir to reduce the pressure of oil in the pores of the reservoir rock trapped. Therefore, for optimal harvest subsurface reservoir due to reservoir conditions, specific methods can be considered. Chemical injection method in order to change the viscosity of the fluid in the oil are stable displacement of the most efficient methods of increasing recovery of oil production in oil fields. The injection process chemicals such as alkalis, polymer and surfactant are concerned that the displacement of the reservoir oil below the surface. In this method of alkali impressing adsorption, has an important role in improving the efficiency of the injection system. Also, in this method of polymer, the improvement of mobility, and Surfactants reduce the surface tension. In the present study enhanced oil recovery by injecting chemicals is studied.

Keywords: Secondary Oil Recovery, Enhanced Oil Recovery, Water Injection

Introduction:

Today, improved oil recovery from the reservoir hydrocarbon production due to the challenges and Economic Costs of exploration and development of oil fields, it is of particular importance (Dang et al, 2011). Generally improved oil recovery is done, according to the method and timing of production through three initial impressions, secondary recovery or EOR. In initial impressions, synthetic oil without additional stimulus, in the normal way to be exploited. However, due to the weak natural stimulant oil, over time, in the pores of the reservoir rock formation hydrocarbon production, has been imprisoned. Thus, secondary and enhanced oil recovery methods are considered. Water injection methods are in the Of secondary recovery methods to improve the efficiency of oil production from reservoirs below the surface, which pressure is increased (Umar & Saaid, 2013; Jing et al, 2013). Water injection in order to move oil in the pores and the formation the production of hydrocarbons, despite being a cost-effective practice in the oil industry is a good achievement to have but can not unless water injection operation, existence is free of impurities (salt) (Bahadori & Zeidani, 2012; Jing et al, 2013). Although water injection to improve the efficiency of oil production, has shown impressive efficacy; however, water injection method in certain circumstances, to move oil alone does not seem efficient and a more appropriate approach in order to mobility and the oil needed. One of the most effective methods to improve oil recovery in the formation, adding chemicals such as surfactants, alkaline and polymer reservoir hydrocarbon production, is in order EOR operations. This material may individually or together, are added to water flooding (Mehranfar, 2013,Abadli, 2012). In the present study oil recovery operations due to chemical injection method is studied. Chemical flooding method, is now one of the efficient methods for increasing oil recovery (after water injection method) (Abadli, 2012; Samanta, 2012; Wang, 2011). In the chemical flooding, alkali, surfactant and polymer (reservoir rock and fluid properties the formation given), factors improvements are increased withdrawals from the reservoir. This material can be injected separately or together. ASP method is a cost-effective methods and conventional in this operation. Mutual effects of each injection material in this method is of particular importance (Hashemi et al, 2015;Samanta, 2012; Wang, 2011).

The effect of alkalis

The results of recent studies emphasize on increasing concentrations of alkaline materials to enhance oil recovery from the reservoir (Abadli, 2012; Samanta et al, 2012; Wang et al, 2011). Many of research results show that the system (chemical flooding) ASP, despite the injection of alkali and surfactant significant reduction in surface tension between the reservoir rock and fluid under the influence of polymer hydrolysis is observed. However combination of surfactant and polymer injection in the absence of Alkaline material, there is no significant impact. Alkaline material with flooding operation injection ASP solution reacts with carboxylic acid crude oil in the reservoir hydrocarbon production. However, due to the presence of Alkaline material in the injection solution can be tangible impact on the surface reservoir rocks expected (Abadli, 2012; Wang, 2011). Despite the cost-effective use of Alkaline material, surfactant the injection material is mainly to reduce the surface tension force alone is not possible by this material (Galas, 2012). The alkaline materials used in this method can be organic acids, sodium

hydroxide and sodium carbonate pointed (Sheng, 2011; Samanta et al, 2012). table 1 shows the chemical properties of Alkaline material commonly used in the method of flooding.

Table 1. Common alkaline material properties in chemical flooding(Sheng ,2011)

material properties	NaOH	Na_2CO_3	Na_4SiO_4	$Na_5P_3O_{10}$
Reduce the surface tension	yes	yes	yes	no
Calcium deposition	yes	yes	yes	
Magnesium deposition	easier than calcium	Much more difficult than calcium	yes	
Emulsifier	good	yes	good	good
Change wettability	yes	yes	yes	yes

The Effects of surfactants

Injection alkalis, chemical flooding operations, may be due to reaction with the reservoir rock the formation hydrocarbon production, the loss of these materials. Therefore, to solve this problem, injecting surfactants, done to flooding solution. The presence of surfactants in the injection solution, can reduce the oil saturation, reservoir remains, have the a favorable effect (Abadli, 2011;Maheshwari, 2011). Due to the nature ionic surfactants into three categories: anionic, cationic and non-ionic classified. Anionic surfactants, of surfactant is effective in the injection material, a chemical flooding the system because this material has a relatively low absorption are the rock the formation. These materials have high stability and salt tolerance is relatively non-ionic surfactants. Surfactants, carboxyl and sulfonate common examples of this category. Often a combination of anionic and nonionic surfactants, in order to tolerate salt, used in chemical flooding. Cationic surfactants are strongly attracted by rock sandstone reservoir which is why they are not used to sandstone reservoirs, however, can be used to carbonate reservoirs (Lake,1989;Abadli, 2012).

The effect of polymeric materials

About how the effectiveness of polymeric materials on force surface tension between the chemical alkaline solution flooding operation ASP, with the formation fluids difference of opinion is different. It is generally believed that the injection of polymeric materials will have a significant impact force surface tension. However believed that some insist that the polymer material can transmit the surfactant in the

solution influence the chemical flooding system and predisposing favorable effects of surfactant,on the surface tension becomes (Sheng, 2011). in Table 2, types of polymeric materials in order to use in chemical flooding methods according to their structure, are provided.

Table 2. Polymeric materials used in chemical flooding and its features (Zhao, 1991)

polymeric materials Structurally	**properties**	**Examples of polymeric materials**
-O-	Low thermal stability, thermal degradation at high temperatures and stable only at less than 80 ° C	HEC, sodium alginate and sodium carboxymethyl cellulose
Has a carbon chain	Good thermal stability and no severe damage under 110 ° C.	Polyacrylamide, HPAM, polyacrylamide and polyvinyl
Has a hydrophilic group -COO-	Net absorption in the sandstones due to the repulsion between chains, settling with calcium and magnesium ions and chemical stability less	Sodium alginate, sodium carboxymethyl cellulose and HPAM
Has a hydrophilic group -CO NH2 or -OH	No deposition of calcium and magnesium ions, good chemical stability, non-chain repulsion between networks and high absorption due to hydrogen bonds formed on the stone sandstone reservoir	Polyvinyl, HEC, polyacrylamide, HPAM

Generally, according to research results made in recent years, the significant impact of polymers in method ASP flooding can be as follows (Mehranfar, 2013; Sheng, 2011 ;Abadli, 2011):

1. Increasing the viscosity of water
2. Reduce the interaction between the formation fluids production of hydrocarbons and alkalis (when high concentrations of alkaline materials)
3. Improvement of mobility (mobility phase shift to mobility displaced)

Figure 1, shows Chemical structure of ASP flooding drilling operations to enhance oil production.

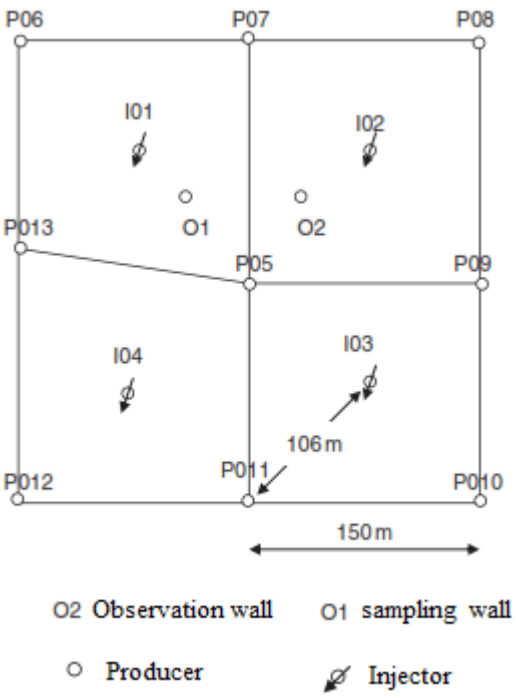
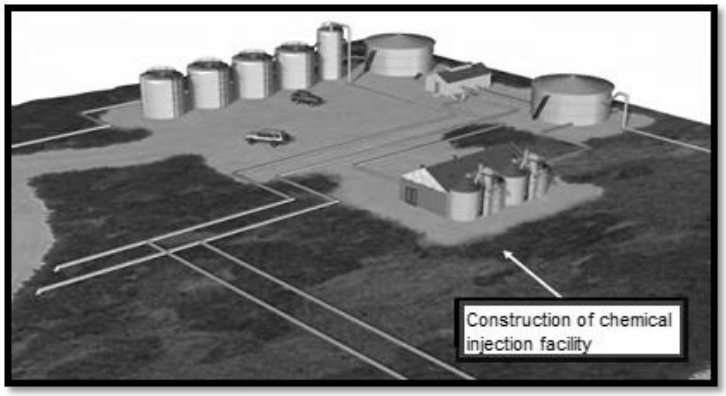


Figure 1. Chemical structure of flooding drilling operations ASP (Chang et al, 2006)

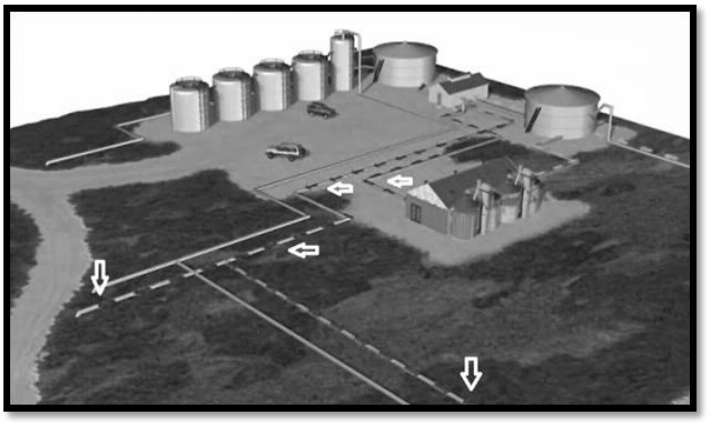
This method, despite the impact and cost-effectively optimize the recovery of oil and oil fields reservoir, can cause the formation of mineral deposits, including calcium carbonate and calcium silicate, and many problems to be followed (Umar & Saaid, 2013; Jennifer et al, 2012; Yu et al, 2011). Figure 2 shows the injection chemicals in chemical flooding the system.



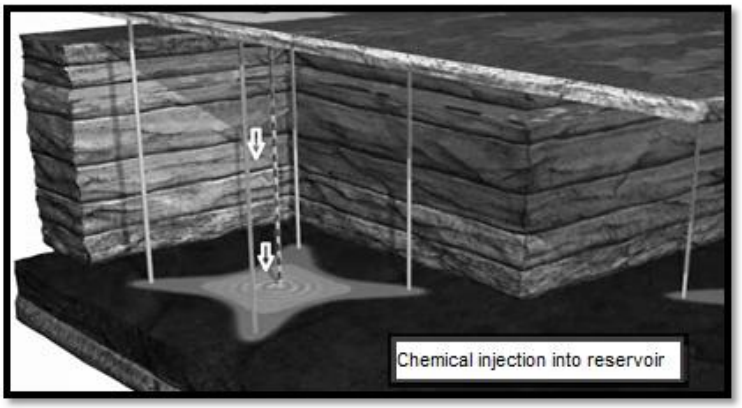
a) build factory chemical injection in oil fields



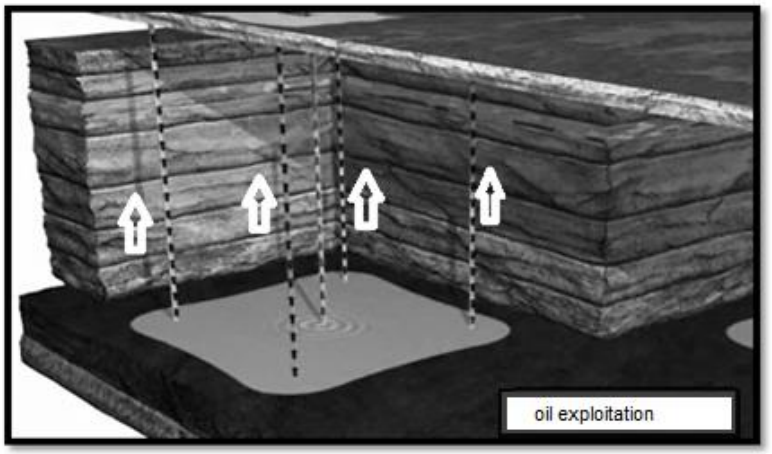
b) transferring water into factory chemical injection



c) injection pump the solution into injection wells



d) injecting chemicals into the reservoir through injection wells



e) operations of oil exploitation due to movement oil in the reservoir

Figure 2. Chemical flooding operation process in order to stable displacement oil in the reservoir (Part a to e)

Conclusion:

World demand for oil due to the natural decline in production of oil from oil fields the formation caused considerable importance methods oil recovery in oil fields is. Today, water injection operations is one of major solutions in the field of secondary recovery of oil and movement oil remaining in the reservoir. stable mobility with a water injection system for the optimal exploitation of oil, when is done, the mobility ratio is less than one that requires increased water viscosity; That Otherwise, the process of unsteady movement, is caused, that for resolve this problem, EOR operations such as chemical injection

is used. In this method injection process chemicals such as alkalis, polymer and surfactant is considered to be improved reservoir pressure declines. Interactive effects caused by combination of three of alkali, surfactant and polymer flooding in the chemical, in relation to the structure of the material is in Injection Solution. In this method of alkali impress adsorption, has an important role in improving the efficiency of the injection system. Also in this method of polymer modified mobility, and Surfactants reduce the surface tension of caused oil will be stable displacement. Despite the successful results of conventional methods of oil recovery, yet this process due to the formation of mineral deposits, a the primary concern for engineers in the field of oil has become. Therefore, considering the climate control and chemical injection in oil recovery operations is essential. The research methodology can be improved by applying the optimization methods such as heuristics (Li et al., 2016), decision-making tools (Tavana et al., 2016), and experimental design (Mobin et al., 2016).

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