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Synergy Study Using New Reagent Under Bio-Infection Oilfield Systems

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ABSTRACT: When transporting the oil pipelines exposed to corrosive metal to corrosive environments - highly mineralized formation water and hydrogen sulfide. To protect the inner tubes used special preparations - corrosion inhibitors that form a protective layer on the metal surface.
Further, the oil is supplied to the primary training on installation for the preparation of oil (CPF), which is used demulsifiers, due to their surface-active properties providing a high degree of dehydration of oil.

KEYWORDS: bio-infection, biocides, synergistic effect, inhibitors

I. INTRODUCTION

The separated oil from produced water is fed back into the reservoir to maintain reservoir pressure (PAP). Development of oil fields by flooding of oil reservoirs leads to infestation of microorganisms, including the most dangerous in the corrosion against sulfate reducing bacteria (SRB). Hydrogen sulfide is formed as a result of vital activity of SRB (sulfate), causes corrosion of oilfield equipment, degrades the quality of the oil and gas, reduces the permeability of the reservoir rock collector up to the complete isolation of individual oil-bearing horizons.

The essential difficulty of this scheme is that for each of the various processes used in the classand the structure of reagents. This in turn requires strict their dosage, so that in the next stage of the process as well as in commercial oil supplied to the refinery (RP), eliminate them.

II. LITERATURE SURVEY

At present, almost all the fields on which to flooding of oil reservoirs using fresh water, contaminated with sulfate reducing bacteria (SRB). Practice shows that infection of oilfield waters SRB sequentially increases from the entrance to the oil emulsion oil gathering and treatment facilities before leaving the facilities reservoir pressure maintenance system (MRP) [1-3].Application for corrosion control technologies successive downloads biocide and corrosion inhibitor does not provide effective protection of the field equipment, as the use of inhibitors does not exclude microbiological corrosion, and one-time injection of large amounts of biocides yields only temporary results. In this regard, a promising method of protection against corrosion of widespread contamination SRB oilfield systems is the use of reagents that can simultaneously protect equipment from corrosion and to inhibit the development of micro-organisms [2,3]. In this regard, of interest to a comprehensive study of the properties of surface-active agent «SCIMOL WS-2651», available in the quaternary ammonium salt - a condensation product of benzyl chloride and alkyldi-methylamine - alkyldimethylbenzylammonium chloride.

III. EXPERIMENTAL RESULTS

Previously, it has been found that chemical reagents based on quaternary ammonium salts are adsorbed and form a protective layer on the surface of the steel sample and effectively inhibit hydrogen sulfide corrosion processes. This results in significant reduction in the number of phases of oxide and sulfate, as well as the complete disappearance of the test in the radiograph of the metal lines y- F203 • H20 [3].

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Vol. 7, Issue 7 , July 2020

Table 1. Comparative characteristics of the reagent «SCIMOL WS-2651» with known chemical reagents

Reagent name	Concentration of example, %	Reagent consumption, g/t	Depth of crude oil dehydration, % (resid. Flooding)	Abrasion DARP, %	Reduced surface tension at the oil-water, at % conc. 100 g/l	Decrease corrosion aggressiveness, Z %
K-1	50	50-150	4,5-0,0	-		75-77
Dissolvan 4411	60	50-150	4,5-0,0	-		-
Altosan	27	25-75	9,0-0,0	50-25		90-96
SCIMOL WS-2651	21	25-50	9,0-0,0	60		94-96

Taking into account the presence of a quatemized nitrogen atom in the structure of quaternary salt, it is possible to assume the presence of bactericidal and amplifying demulsification properties of the test reagent. Assessment reagent bactericidal action performed by RD 39-3-973 and other sources [4-7], In experiments carried out on the functionality of the reagent samples with different «Kokdumalak» MRP system positions the deposit (Table. 2).Reagent «SCIMOL WS-2651» were added to medium peptone agar (PA) at a concentration of 0.1; 0.3 and 0.5% of the total volume of the culture medium. The total number of microorganisms were counted in Goryaeva chamber. The presence of hydrogen sulfide was quantified after 5; 10; 15-day exposure system, followed by iodine titrated solution, 10% hydrochloric acid and titration with sodium thiosulfate. The quantity of hydrogen sulfide was calculated by the formula [5,7] H_2S (mg/1) = [(a-b) KN 17·1000] / V, where: a - the amount of thiosulfate solution consumed for titration of the control sample, ml; b - the amount of thiosulfate solution consumed for titration of the control sample, ml; K - correction factor thiosulfate solution; N - normality of thiosulfate solution; 17 - equivalent to the weight of H_2S; V - sample volume, ml.It should be noted that for all the investigated quantities of reagent introduced significantly slowed the growth of cultures; the effectiveness of the impact of the reagent on the growth of crops is determined by 14 days of cultivation. The results of these studies are presented in Tables 2.3.Analysis of the data presented in Tables 2,3, allows a positive test to judge the effectiveness as a biocide chemical agent that suppresses completely within 5-14 hours of growth at planktonic SRB dosage forms of 15-75 g/m^3, to form adherent - 200-400 g/m^3 respectively. To completely suppress the growth of microorganisms identified aggressive permissible in a particular object to increase the dosage of plankton to 100 g/m^3, and adhered to - 600 g/m^3 while maintaining the exposure time.

Table 2. Characteristics of the analyzed samples

Position of sampling	Index					
	Spring period			Summer period		
	Temperature t, °C	Density d, g/cm^3	Environment pH	Temperature t, °C	Density d, g/cm^3	Environment pH
Scrapings from the pipe outlet manifold pump	-	-	-	-	-	-
The water reservoir tank with PBC 2 UPN	44	-	7,0	54	-	7,3
Produced water+make-up at the	40	-	7,8	47	-	8,0

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Vol. 7, Issue 7 , July 2020

pump inlet when the tank						
Water o.Alan	28	-	7,82	26	-	8,3
Oil is a commodity with pumps	43	0,848	-	50	0,852	-
Oil SP-3 (Rev.)	55	0,865	-	62	0,870	-
Scrapings from the output of well SP-3	-	-	-	-	-	-

Taking into account that the inhibitors are and demulsifiers are used in oil fields and also that the drug «SCIMOL WS-2651» has a relatively high average molecular weight (range 310-368), is of practical interest to determine the polyfunctional reagent under test and compatibility with other chemical reagents - known demulsifiers and bactericides.Taking into account the feature of the quaternary salts, of interest to consider demulsibility test reagent «SCIMOL WS-2651» in comparison with the known K-l. Table 5 shows the results of the experiment, sludge temperature 60 ºC, the initial water content of the emulsion – 59%.Data analysis Table 5 shows the examination reagent permissibility «SCIMOL WS-2651» as the polyfunctional apparent, due apparently, the main feature of the structure of the reagent components - an active quatemized nitrogen. At the same time prepared the oil meets the requirements of GOST 9965 [8].

Table 3. Effect of reactant «SCIMOL WS-2651» on the degree of suppression of biocenosis*

Sample №	Amount of aggressive microorganisms	Biocide g/m^3	The degree of suppression, %
1	$9{,}79\cdot10^3$ (adherent form)	25 50 75 100 150 200 250 300 350 400	12,8 15,5 35,9 50,0 62,7 / 75,1 67,2 / 82,4 75,3 / 91,9 80,1 / 97,5 90,5 / 100 100
2	$11{,}7\cdot10^4$	25 50 75 100	26,8 / 59,5 38,9 / 100,0 75,9 100,0
3	$6{,}26\cdot10^4$	25 50 75 100	28,4 / 75,8 41,5 / 95,5 80,9 / 100,0 100,0
4	$7{,}36\cdot10^4$	25 50 75 100	30,5 / 75,8 57,8 / 95,6 83,3 / 100,0 100,0
5	$8{,}6\cdot10^3$	25 50 75	32,5 / 75,8 60,8 / 95,6 83,3 / 100,0

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		100	100,0
6	$9,4 \cdot 10^3$	25 50 75 100	32,5 / 75,8 60,8 / 95,6 83,3 / 100,0 100,0
7	$10,4 \cdot 10^3$ (adherent form)	100 150 200 250 300 350 400 500 600	50,0 62,7 / 75,1 67,2 / 82,4 75,3 / 91,9 80,1 / 97,5 90,5 / 100,0 95,8 / 100,0 97,5 100,0
8	$9,1 \cdot 10^3$	25 50 75 100	45,1 / 60,5 80,9 / 97,5 95,3 / 100,0 100,0
9	$9,6 \cdot 10^3$	25 50 75 100	44,1 78,9 97,5 / 100,0 100,0

* Data on reagent «Altosan» presented in the denominator

Table 4. Effect of reactant «SCIMOL WS-2651» on the degree of suppression of the SRB*

Sample №	Amount of SRB	Biocide g/m^3	The degree of suppression, %
1	$1,3 \cdot 10^2$ (adherent form)	25 50 75 100 150 200	5,6 28,5 35,1 / 80,9 67,4 / 95,7 87,3 / 100,0 100,0
2	$2,2 \cdot 10^1$	15 25 50 75	70,0 85,7 / 95,8 93,8 / 100,0 100,0
3	$4,9 \cdot 10^3$	15 25 50 75	63,0 76,9 / 94,9 97,5 / 100,0 100,0
4	$5,4 \cdot 10^3$	15 25 50 75	41,8 76,8 93,7 / 100,0 100,0
5	$4,8 \cdot 10^2$	15 25 50 75 100	50,8 67,9 87,9 / 100,0 98,7 100,0
6	$5,2 \cdot 10^2$	15 25 50	60,1 75,8 / 95,9 87,9 / 100,0

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Vol. 7, Issue 7 , July 2020

		75 100	98,9 100,0
7	$5,5 \cdot 10^2$ (adherent form)	50 75 100 150 200 250 300 400 500	18,9 25,8 35,6 50,6 / 78,5 68,9 / 85,7 75,3 / 95,6 89,0 / 100,0 97,3 / 100,0 100
8	$5,6 \cdot 10^2$	15 25 50 75	58,9 / 75,0 75,9 / 87,0 89,9 / 97,5 100,0 / 100,0
9	$5,7 \cdot 10^2$	15 25 50 75	57,8 / 75,9 78,9 / 85,7 86,9 / 99,1 100,0 / 100,0

* Data on reagent «Altosan» presented in the denominator

Table 5. Comparison of results easy demulsification oil emulsion reagents «SCIMOL WS-2651» and «K-1»

Sampling site	Brand reagent	Reagent consumption		Segregate water during the time (ml)					Residue water, %
		g/t o.e.	g/t o.e.	1h	2h	4h	6h	8h	
Kokdumalak field	«SCIMOL WS-2651»	70	170	3	10	22	32	49	10
		80	195	8	17	30	52	55	0,4
		90	219	12	33	38	56	-	0
	«K-1»	80	195	4	23	34	43	53	4,5
		90	219	10	29	42	57	-	0

Table 6. Effect reagent «SCIMOL WS-2651» on the performance of chemicals

Name reagent	Consumption «SCIMOL WS-2651»	Consumption reagent g/t	Depth of crude oil dehydration, % (Residues Flooding)	Abrasion DARP,%	Reducing corrosiveness, Z %
«K-1»	25	50	2,5	-	85
«Dissolvan 4411»	50	50	1,8	-	-
«Altosan»	25	25	4,0	70	98

IV. CONCLUSION AND FUTURE WORK

To determine the possible options «SCIMOL WS-2651» co-administration with other chemical reagents preparation was determined compatibility in dosages (Table 6) used in the processes of preparation of oil. It was found that the mixture of chemicals to test chemicals in solutions form a table system without bundles.Analysis of data in Table 6 shows that the combined application of drug «SCIMOL WS-2651» with a demulsifier K-l increases its inhibitory capacity by 14%, demulsibility - 45%; sharing with Dissol- vanom-4411 - demulsibility increases by more than 50%; corrosion inhibitor mark «Altosan» - by almost 10% inhibition improves its capacity, and by 40% for flushing and paraffin 50% - demulsibility.Thus, as a result of the research found that the chemicals based

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on quaternary ammonium salts (in particular «SCIMOL WS-2651») are polyfunctional, in universal fishing oil preparation process [8]. Chemicals brands «SCIMOL WS-2651», in addition to hydrogen sulfide corrosion inhibiting declared properties, exhibits bactericidal and water separation properties. These aspects are in practical terms:

- eliminate the need for the selection of inhibitors, emulsion breakers and biocides for compatibility;
- eliminate the possibility of contamination of oil emulsifier or a corrosion inhibitor and bactericide owing unlimited solubility test reagent in water;
- reduce the time required for the demulsification because this process begins in the pipeline when oil transportation when administered as a corrosion inhibitor;
- combining with appropriate reagents, as a result ofsynergism, improvesthe quality of biocide and corrosion inhibitor treatment.

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