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Supsa Crude Oil Demulsification Technology Development by Usingnon-ionogenic Surfactant Solution

N. Mamulaishvili[1*], G. Partskhaladze[2], G. Chavleshvili[3], R.Zoidze[4], T. Khitarishvili[5]

1*- Associated Professor. Batumi Shota Rustaveli State Univefsity, Georgia; E-mail: n.shvili@rambler.ru ; nora.mamulaishvili@bsu.edu.ge;
2- Professor. Batumi Shota Rustaveli State University, Georgia;
3- Associated Professor. Batumi Shota Rustaveli State Univefsity, Georgia;
4- Magistracy student of the Faculty of Technology;
5- Doctoral student of the Department of Oil and Gas Technologies, Georgian Technical University, Tbilisi.
*Corresponding author email id: n.shvili@rambler.ru

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Abstract – **The paper considers the reasons and areas for the formation of a stable oil emulsion in the oil production of the Supsa deposit. The effectiveness of the destruction of oil emulsion with the use of nonionic surfactant solutions is shown. The results of the process of deemulsification of crude oil using a nonionic deemulsifier, ''ALKAN DE 202'' are presented. The physicochemical parameters of crude oil, density, surface tension, the amount of water released and the demulsifier efficiency factor are determined and calculated.**

Keywords – **Supsa, Demulsification, Emulsion, ALKAN DE 202, SAS.**

I. Introduction

The paper considers the reasons and areas for the formation of a stable oil emulsion in the oil production of the Supsa deposit. The effectiveness of the destruction of oil emulsion with the use of nonionic surfactant solutions is shown. The results of the process of deemulsification of crude oil using a nonionic deemulsifier, ''ALKAN DE 202'' are presented. The physicochemical parameters of crude oil, density, surface tension, the amount of water released and the demulsifier efficiency factor are determined and calculated.

One of the main problems of oil production technology, of the Supsa deposit. [1], includes oil emulsion and their demulsification. Emulsions originate at the various segments of oil well operation: in the process of pumping water into the oil well for preservation of stratum pressure emulsion originates in the bottomhole zone, oil piping and not in the productive zone. Stability of such emulsion depends on content of the own emulators in stratum oil: naphthenes, SAS-es, pyrobitumen, paraffin, resins. The more is stratum water mineralization, the more stable is emulsion. [2]. Stability of emulsion also depends on kinds of machines used. Unstable emulsions originate in operation of sucker-rod pump; origination of the stable emulsions relates to turbulent movement of air-to-liquid flow [3]. That is why, the produced cruse oil needs preliminary treatment up to marketable condition for further transportation and processing.

In the modern period, the following demulsifiers of foreign origination are widely used: "disolvans", "separols" "progalits", "cemelix" etc. It shall be noted, that the most demulsifiers are very expensive and averagely 1 ton of demulsifier costs 3500 US Dollars. Have chosen the surface-active agent as deemulsifier. [4]. It is a non-iogenic SAS solution having capacity of decrease of surface tension at the water-oil phase interface and their separation. It is produced in Baku with the production facilities of the oil company of the Republic of Azerbaijan. [5].

The experiments were performed in the training and research laboratory of the Faculty of Technology of Batumi Shota Rustaveli State University. We determined physicochemical parameters of deemulsifier under research. For the purpose of determination of deemulsification capacity, we determined physical and technological parameters in the system (water-oil), namely: density, liquid surface tension, quantitative indexes of water release and coefficient of deemulsifier efficiency.

II. Experimental Part

First, we produced oil emulsion with Supsa oil (233 ml of oil was added 100 ml of distilled water). For mixing of oil and water and production of homogeneous consistence it was necessary mechanically treat emulsion with the mixer during 5-7 minutes. Resulted, we produced homogeneous emulsion without any segregations [6].

For determination of surface tension we have used comparative method [7]; [8], according to which, we count drops for standard liquid n0 and surface tension σ0, known for liquid, for example, in case of water σ = 72, 75 mN/M (200 C); surface tension of the liquid under research is calculated with the formula:

$\sigma_x = \sigma_0 \frac{n_0 \rho_x}{n_x \rho_0}$	(1)

Where: n_0 and n_0 are quantity of drops for standard and researching liquids; ρ_0 and ρ_x are densities for standard and researching liquids.

The samples were prepared in the graduated cylinders in amount of 100 ml each. Then we injected determined quantities of demulsifier into each sample (0.005 – 1.0 ml). The process of demulsification lasted at T=20-22ºC during 30-40 minutes resulting origination of two separated phases: the upper phase of oil and the lower phase of water (fig. 1)

Fig. 1. Demulsifier in operation

TABLE 1. Results of research of demulsification in the system (water oil)

Non-iogenic SAS solution added, ml	Surface tension, N/m	Volume of water released on application of DE-202, ml	coefficient of demulsification efficiency, DE-202 -E. %	Mass fraction of released water % on of Disolvan
0.005	72	21	70	60
0.010	74	25	73	70
0.025	76	27.5	91	85
0.05	80	28.5	95	90
0.075	75	26.5.	88	94
1.0	70	26.	86	98

It shall be noted, that for release of water, the sample were simultaneously centrifuged. The results of research are shown in the table (Table 1) and diagram (fig. 1). The table shows that maximum quantity of water is released at concentration of 0.025-0.05ml. In the oil production practices changes of demulsifier consumption standards is limited and they shall be complied. Its change is permitted in the frames from 15-25 to 50-60 g per ton of oil.

Demulsification efficiency coefficient is determined with the [9] correlation:

$$E = \frac{V}{V_0} \cdot 100\% \quad (2)$$

Where: **V-** Volume of water released in the graduated cylinder, ml;

V_0 - Initial quantity (volume) of water injected to emulsion, ml;

E – Demulsification efficiency coefficient, %. [9];

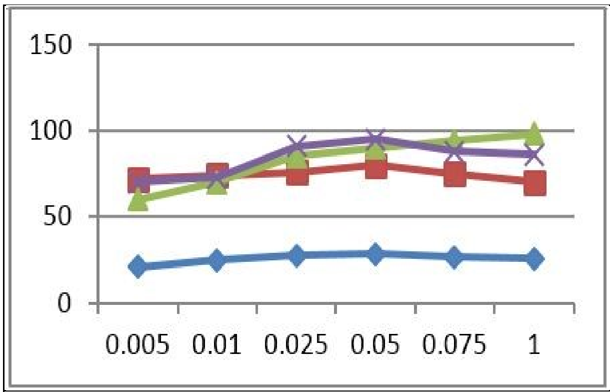

Fig. 2. Dependence between demulsification efficiency coefficient and concentration of deemulsifier

Conclusion

Based on the experiments we have proved that in the water-oil system non-iogenic demulsifier's efficiency is enough high and it changes in the diapason of 0.92-0.93%. Demulsifier's efficiency is clearly shown in Fig. 2. It shall be noted, that in Georgia demulsification of oil emulsion by the named non-iogenic SAS solution is not provided and we schedule to start its use.

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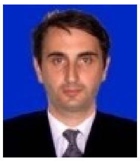
Authors' Profiles

N. Mamulaishvili - doctor of Chemical Technology, of the Faculty of Technology of Batumi Shota Rustaveli State University, Georgia.
e-mail: n.shvili@rambler.ru
nora.mamulaishvili@bsu.edu.ge



G. Partskhaladze – doctor of engineering, Dean of the Faculty of Technology of Batumi Shota Rustaveli State University, Georgia.

G. Chavleshvili - doctor of engineering. Head of the Faculty Quality Assururance Service, of Batumi Shota Rustaveli State Univefsity, Georgia.