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RESEARCH AND CONTROL THE VISCOSITY OF OIL DISPERSE SYSTEMS

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ABSTRACT

In this paper was shown the factors that determine the properties of the oil as a non-uniform dispersion system: particulate composition factor of stability of the system, the distribution of the dispersed particles in a volume force due to the dispersion medium. Showing the parameters defining the properties of oil disperse systems disperse composition, stability factor, the distribution function of the particles dispersed in oil volume, the strength of the interaction of the dispersed particles of the dispersion medium.

KEYWORDS: Research, Control, Viscosity, Disperse, System, Analysis, Roperties, System, Methods, Influence, Factors, Affects, Properties, Homogeneous, Composition, Function, Medium, Stability, Factor, Composition, Distribution

INTRODUCTION

The shown are the factors that determine the properties of the oil as a non-uniform dispersion system: particulate composition factor of stability of the system, the distribution of the dispersed particles in a volume force due to the dispersion medium. The ways of controlling the properties of VAT, and methods of influence on the viscosity of the fluid.

The analysis of crude oil as if dispersed system is carried out. They are the dispersed content, factors of stability, allocation of dispersed drops in the oil and their connection with dispersed system. There was defined the ways of regulation the property of oil and the methods of affects on viscosity these systems.

Vysokoparafinistyh and highly viscous oil (VPN, BBH), concentrated water-oil emulsions (VNE) of these oils are non-Newtonian fluids in a certain temperature range. Oil as a liquid is not homogeneous and should be considered as an oil dispresnuyu system (VAT). Comparative analysis of the rheological properties of these dispersions (VPN, VNE) shows the presence of many general properties, characteristic of non-Newtonian fluids, complicated dispersion system / 1 /.

In mining and oil collection is a mixture of different oils wells and areas, which further complicates the particulate composition of the oil mixture.

In the literature there are papers on the definition of the viscosity of the mixture of different oils / 2 /, the use of calculation formulas and their comparison with experiment.

Table 1: Kinematic Viscosity Binary Mixture of Oils (I) (II)

Oil Sample	Viscosity ν, мм²/С	Temperature, °C			
		20	30	40	50
Kalamkas Skye (I)	$\nu_{эксп}$	122,5	78,5	44,6	31,7
Karajanbas Skye (II)	$\nu_{эксп}$	1051,0	490,5	275,7	146,7
The binary mixture №1	$\nu_{эксп}$	220,1	120,6	68,9	46,5
I :II = 3:1	$\nu_{расч}$	196,4	117,6	66,3	44,3
The binary mixture №2	$\nu_{эксп}$	195,4	117,2	66,2	43,3
I :II = 1:1	$\nu_{расч}$	328,3	182,5	102,3	62,9

Analysis of the results shows that there is a significant discrepancy between experiment and calculation. This is due to the complexity of the disperse system. The calculation formulas do not take into account the processes occurring when mixing different oils. One of them is the following. Oil as a dispersion composed of a disperse phase and a dispersion medium. When the amount of dispersion medium is adsorbed portion is desorbed from the surface of the dispersed oil components dispersed systems. the reverse process can occur when mixing the other oils. These processes also occur when changing the temperature and pressure conditions in the external physical influences. The study of these processes and their effect on the viscosity of the oil is the aim of this work.

Status consideration disperse systems (VPN, BBH, VNE) defined by the following parameters: particulate composition factor of stability $f(\rho)$

$$f(\rho) = \frac{\Delta\rho - F/V \cdot g}{\eta} \tag{1}$$

and the distribution function of particles dispersed in the volume of oil $f(h)$ / 3 /

$$f(h) = \exp\left(-\frac{mgh}{E_T}\right) \tag{2}$$

Where $\Delta\rho$ - the difference between the densities of the dispersed phase and the dispersion medium; F - Strength of the interaction of a particle with the dispersion medium; m, V - The mass and volume of the particle; η - The viscosity of the oil; q - acceleration due to gravity; h - Height; E_T - The energy of turbulent fluctuations.

The presence of certain forces of interaction F of dispersed particles in the dispersion medium causes an increase in the stability of the disperse phase. This interaction depends on the thickness and composition of the adsorption and solvate layer (ACC) on dispesnyh particles particle size (contacting surface area). Quantitatively, it can be expressed in terms of interaction force per unit surface area of the particle τ .

With regard to the formation of ACC VNE surface active components on a drop of water changes the average value of its density / 3 /:

$$\Delta\rho_k = \left(\frac{r}{r+\Delta r}\right)^3 (\rho_в - \rho_н), \quad (3)$$

Where r - the radius of the drop; Δr - The thickness of the ACC thereon; $\rho_в, \rho_н$ - Density of water and oil.

The minimum value of interaction force drops per unit surface, ensuring its stability, is given by expression:

$$\tau_{\min} = \frac{1}{3}(\rho_в - \rho_н)\cdot g \cdot \frac{r^3}{(r+\Delta r)^2}, \quad (4)$$

In this case, the emulsion will have unlimited sedimentation stability.

Adsorption of the surfactant on the oil drop component and / or dispersed particles causes the latter are connected to the shell of a substance with the homogeneous dispersion medium. Any relative motion of the particles of the dispersion medium will be possible only after overcoming the force of interaction with it. The value of this force per unit area is the ultimate shear τ_0 stress to drop.

Dispersion droplets of the dispersed particles increase even if the thickness of the minimum value the ACC $\Delta\rho$ power increases due to a dispersion medium:

$$F = \sum \tau_i \cdot S_i, \quad (5)$$

where S_i - the surface area of each drop.

The rest is an increase in the thickness of the ACC particulate matter, increase its stability by strengthening the connection with the dispersion medium. These processes are accompanied by an increase in the limit of shear stress for the system as a whole and for each drop individually. Also increases the effective viscosity of the system.

When external forces are destroyed relationships formed in the dispersion. Upon heating and mechanical stress occurs initially break the macro-, the destruction of a single spatial frame in the system volume. A further impact will be a decrease in the size of the individual agglomerates, hereinafter - the reduction in the thickness ACC Δr individual droplets. These processes can be called destruction mikrosvyazey system. Destruction mikrosvyazey is slower and not completely. Cessation of external influence leads to the return of the system to its original state. The dynamics of these processes in the dispersion can be monitored by measuring the effective viscosity of the fluid.

We study the dependence of viscosity on temperature VPN at different shear rates (Figure 1) have been carried out; VPN dependence of viscosity on shear rate at various temperatures (Figure 2) and the change in the effective viscosity VNE during its aging / 1 /.

Destruction mikrosvyazey VAT by vibrational effects at certain frequencies allows the conversion of destructive relationships. This is accompanied by a change in the rheological properties of the fluid, such as viscosity and pour point.

The atoms in polyatomic molecules, e.g. hydrocarbons have vibrational and rotational degrees of freedom, discrete energy levels. The vibrational-rotational spectra of hydrocarbons are located in the area of infrared radiation.

Therefore, the infrared radiation may be used to enhance the vibrational-rotational motions of atoms in the molecules by energy supply from the source of said radiation.

For transfer of vibrational energy to the liquid can be used and other sources of vibrational movements, for example, electromechanical, magnetostrictive, piezoelectric, hydrodynamic.

The change in the viscosity of VAT affects complex factors that can be considered as a synergistic process in the form of the following components.

- Aktivatsiya solvent dispersion medium capacity;
- Usilenie vibrational processes of the dispersed phase and the entire system;
- Razrusheniya links between dispersed particles and a dispersion medium;
- Uvelichenie frequency and severity of collisions of particles dispersed among themselves and with the vessel walls.

To maximize the effectiveness of external influence on the liquid necessary to determine the conditions and modes of its treatment.

Hydrocarbon fluid processing under these conditions provides an effective transformation of destructive molecular bonds in oil disperse systems. Objectively, this is manifested in the form of a favorable change in the rheological properties of the fluid / 3,4,6 /.

One of the most effective methods of reducing the viscosity of the water-oil emulsion is its hydrodynamic processing in a centrifugal field.

One embodiment of this processing is realized when a liquid flows through a progressive-reversal (serpentine) trajectories with the number of at least 10 reversals and a length of the straight section greater than the turning radius is 9-10 times in a sealed condition / 5 /.

This VAT treatment method gives a good effect in the destruction of oil-water emulsions of heavy and viscous oils, and providing dehydration and desalting to the required level.

On a non-uniform oil dispersion is greatly affected by the high-voltage electric field. It was shown experimentally that in this field there is a rapid separation of the spent motor oil mechanical impurities and water, some oil degradation products. There is a significant increase in optical transparency oil. The effective viscosity is reduced by 1.5-2 times / 6.7 /.

Reduced viscosity BBH 1.5-2.5 times it occurs when processing a combined magnetic field of complex configuration. Thus efficiently separates oil from emulsified water / 7 /.

CONCLUSIONS

- It is shown that the displacement of various oils formed complex dispersion, physical and chemical properties of which depend on the ratio of components and the conditions of their displacement.
- Showing the parameters defining the properties of oil disperse systems disperse composition, stability factor, the distribution function of the particles dispersed in oil volume, the strength of the interaction of the dispersed

particles of the dispersion medium.

- The influence of different electromagnetic fields on Oil disperse systems and identify the most effective management mode and adjust the viscosity of liquids

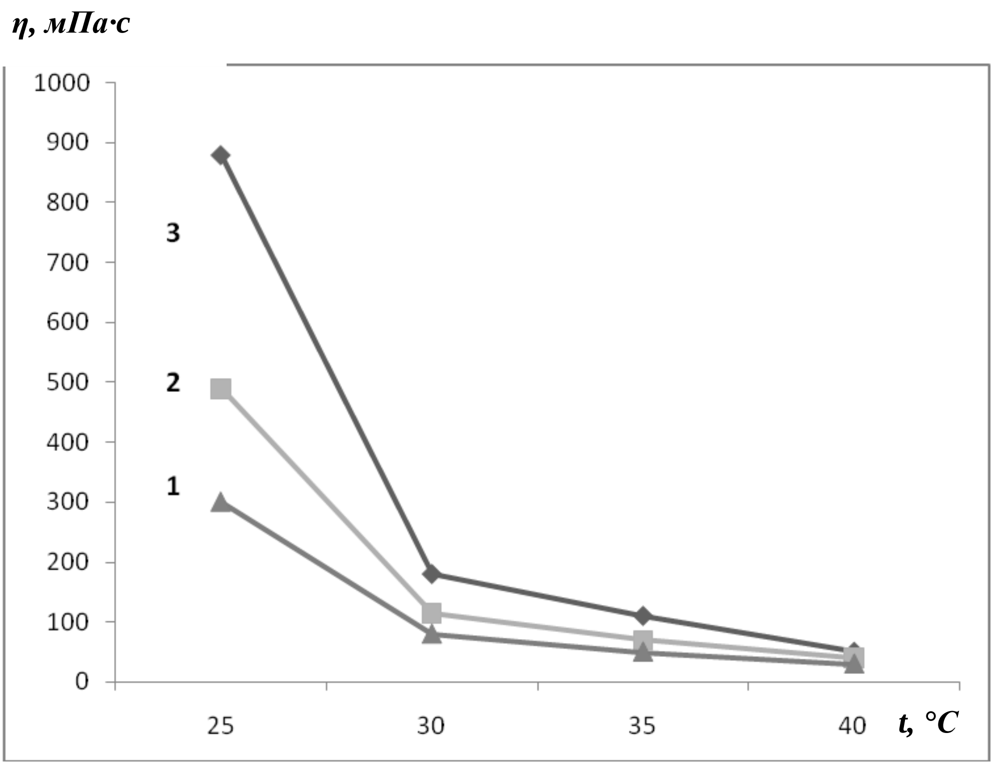

Figure.1: Zavisimost Effective Viscosity of the Vpntemperature at Shear Rates of: 1 27 c^{-1}; 2 – 81 c^{-1}; 3 - 243 c^{-1}

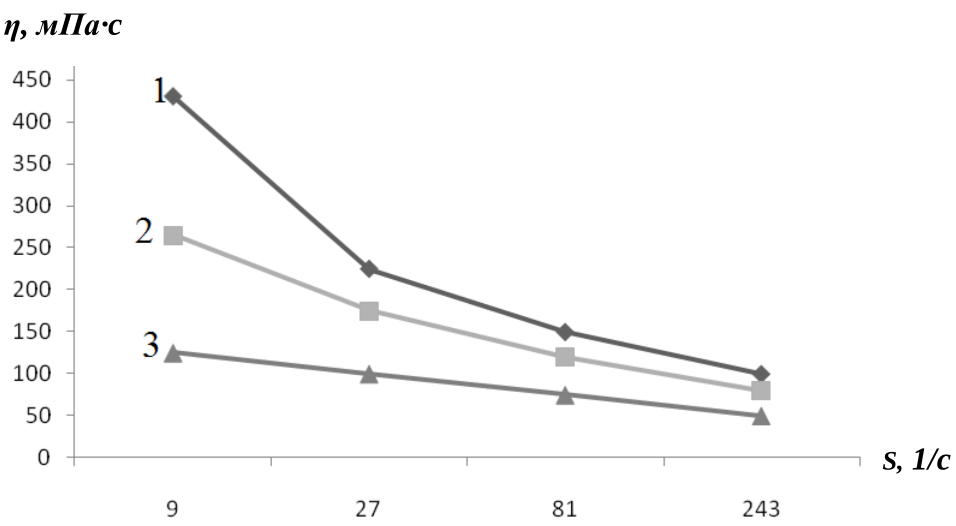

Figure 2: The Dependence of the Effective Viscosity of the VPN Speed Shift at Different Temperatures: 1 – 27 ˚C; 2 –30 ˚C; 3 – 35 ˚C

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