DEVELOPMENT OF METHODS OF DETERMINATION OF DISPERSE COMPOSITION OF OIL EMULSION

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Disperse composition of oil emulsion (OE) or the law of distribution of emulsified water by drops dimensions is an integral performance index of raw materials in the process of oil treating. This parameter characterizes operating mode of production and transportation of oil, so quantitative determination of this index with required accuracy is one of the actual problems of oil production and this report is devoted to this problem.

Essence of the proposed methods is in the following. In industrial conditions representative sample is taken from stream from dehydration boxes to a specially designed for this purpose graduated vessel (Figure 1) and settle at the temperature equal to the temperature of stream fixing quantity of precipitated water ($W_в$) and settling time (τ). Then these fixed data are expressed with adequate accuracy in hyperbolic dependence [1]:

$$W_в = \frac{\tau}{a + b\tau} \tag{1}$$

where *a,b* are factors to be determined experimentally.

We can determine by Stokes law the following:

$$\tau = h / \left[\frac{2}{g} \cdot \frac{\rho_в - \rho_н}{\mu} r^2 \right] = S / r^2 \tag{2}$$

where h is height of settling zone; $\rho_в, \rho_н$ are density of reservoir water and oil; g is acceleration of gravity; μ is dynamic viscosity of oil; r is radius of drops.
We can derive the following from the theory of sedimentometric analysis [2]:

$$f(r) = -\frac{2\tau^2}{r} \cdot \frac{d(W_в)}{d\tau^2} \tag{3}$$

where $f(r)$ is density of distribution of emulsified water by drops dimensions.
We'll derive the following substituting $W_в$ and τ from (1) and (2) to (3):

$$f(r) = \frac{4ab}{S} \cdot \frac{r}{(a + \frac{b'}{S} r^2)^3} \tag{4}$$

Factors a and b are expressed through hydrodynamic parameters of stream influencing directly on the function $f(r)$ in order that formula (4) may find wide application. For this purpose averaged (modal) radius of drops is determined by Kolmogorov-Huseynov formula [3]:

$$r_m = KR \left(\frac{\rho_н}{\rho_b} \right)^{1/7} \left(\frac{1}{\nu_n} \sqrt{\frac{\delta}{\rho_b R}} \right)^{6/7} \tag{5}$$

Then averaged r is determined depending on S_1, a and b.

$$r_{cp} = \frac{\int_0^\infty r f(r) dr}{\int_0^\infty f(r) dr} = \frac{\pi}{4} \sqrt{S \frac{a}{b'}} \tag{6}$$

Factors a and b are expressed through hydrodynamic parameters of OE stream equating (5) and (6) ($r_m=r_{cp}$) subject to formulas (1) and (2):

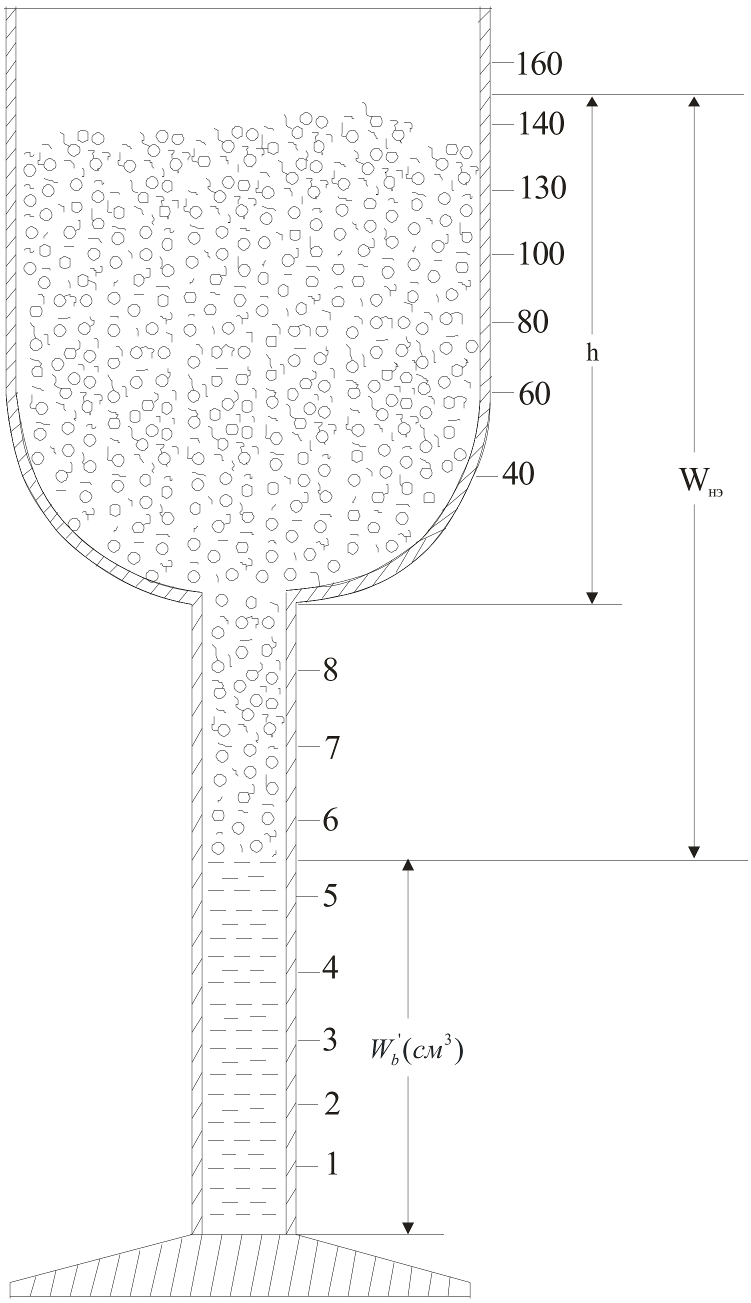

Figure 1. Graduated vessel for sedimentation

$$a = \frac{r_m^2 \tau}{W_b \left(S \frac{\pi}{16} + r_m^2 \tau \right)} \qquad (7)$$

$$b = \frac{\pi^2 S}{16 W_b \left(\frac{\pi^2 S}{16} + r_m^2 \tau \right)} \tag{8}$$

$$W = W_b^{'} \big/ (W_b^{'} + W_{нэ}) \tag{9}$$

Subject to (7) and (8) formula (4) expresses the law of distribution of emulsified water by drops dimensions depending on hydrodynamic parameters and doesn't require determination of value *a* and *b* by sedimentometric method that enables to use it in solution of the problem of optimization of technological processes of oil dehydration and desalting.

Carried out calculations show that mean-square deviation of r_m from r_{cp} is 6,62% and this means that proposed methods may be used with adequate accuracy in problems of intensification of processes of complex oil treating and in calculations of other disperse systems.

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