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Determination of the Rate of Deposition of Solid Particles of Mechanical Impurities

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ABSTRACT. In this article are given results of definition of a factor of division at purification of oil slime of mechanical impurity in centrifugal field and also the sizes and mass of firm particles as a part of oil slime from 10 microns to 500 microns are determined.

KEYWORDS: the mass of particles, oil slime, mechanical impurity, centrifugal fields, a division factor, gravitational weeding.

I. INTRODUCTION

Oils, accumulated on the sewage facilities of the refinery, can be divided into two main groups: dropping directly on the sewage treatment plants and accumulated over a number of years stored in the slurry accumulators. The oilshlam consists mainly of solid sandy, clay particles, industrial dust, coke and soot, corrosion products, suspensions of hydroxide metals, alkaline-land carbonates, carbonates Oils as a certain dispersed system of coagulation structure has the properties of thixotropy, i.e. After the mechanical effect (dilution of water and intensive mixing) is restored over time. Oils Used to obtain claying in the production of which to reduce the volumetric density of clays use various organic additives, including polyglycols, sulphide yeast bard, diesel fuel, fuel oil, kerosene, piol For most centrifuges, the fraction of the separation F does not exceed 3500 and is an average of 500-1000 [2,3]. The greater the separation factor, the higher the separating ability of the centrifuge. The separation factor can be increased by increasing the radius of the drum and to an even greater extent - increasing the number of revolutions. ($\omega^2 = \frac{\pi^2 n^2}{900}$), Since the value of F is proportional to the square of the number of revolutions [4].

II. SIGNIFICANCE OF THE SYSTEM

The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. METHODOLOGY

To determine the division factor, we conducted a series of experiments in the gravitational and centrifugal fields, also theoretically calculated to determine the precipitation rate of solid particles of mechanical impurities in various fields. In order to determine the rate of free precipitation of solid particles in the gravitational field, the Stokes formulas were used, in m / s (for Re (0.2) [5]:

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Vol. 7, Issue 5 , May 2020

$$\omega_{oc} = \frac{d_э^2 g(\rho_T - \rho_c)}{18\mu}, \quad (1)$$

where: DE is an equivalent particle diameter, m; g - acceleration of free fall, G = 9.81 m / s2; (- particle density, kg / m3; (- dynamic viscosity of the medium, PA * with. The determination of the precipitation rate of a spherical single particle in a fixed unlimited medium was determined using the Archimedescript:

$$Ar = Ga\frac{\Delta\rho}{\rho_c} = \frac{\mathrm{Re}^2}{Fr}\frac{\rho - \rho_c}{\rho_c} = \frac{d^3(\rho - \rho_c)\rho_c g}{\mu^2}, \quad (2)$$

где$Ga=Re^2/Fr$ –

Galilean's criterion. The frude criterion was calculated by the following formula:

$$Fr_ц = n^2 d / g, \quad (3)$$

where the N-frequency of the flux rotation, C-1; D-diameter of hydrocyclone, m; G = 9.81 m / s2 Acceleration of free fall. Reynolds criterion determined: $\mathrm{Re} = \frac{\omega d\rho}{\mu}$,

where (- flow rate, m / s; d - hydrocyclone diameter, m; (- density medium, kg / m3; (- dynamic environmental viscosity coefficient, PA * s. Based on the calculations, hydrodynamic mode inside the hydrochlor

$$Ly = \frac{\mathrm{Re}^3}{Ar}\frac{\mathrm{Re}\,Fr\rho_c}{\rho - \rho_c} = \frac{\omega_{oc}^3\rho_c^2}{\mu_c(\rho - \rho_c)g}. \quad (4)$$

Centrifugal force (in H), acting on a particle, is:

$$C = mn^2 / R = m\omega^2 R, \quad (5)$$

where: m - the mass of the particles, kg; (- the angular speed of rotation of the particle, C-1; N is the circumferential speed of rotation of the particle, C-1; R- Radius of the rotation of the particle, m. The power of gravity:

$$P = mg. \quad (6)$$

Solving equations (1) and (5), we get:

$$K_p = \frac{C}{P} = \frac{m\omega^2 R}{mg} = \frac{\omega^2 R}{g}, \quad (7)$$

Where: CR - separation factor. To determine the precipitation rate of solid particles of mechanical impurities, various particles (stone, sand, earth) of various sizes were taken (stone, sand, earth), i.e. from 10 μm to 500 microns. The sedimentation diameter of solid particles (in μm) was calculated by the following formula:

$$d_s = \sqrt{18\cdot 10^7 \mu H/(\rho_1 - \rho_2)g\tau}, \quad (8)$$

where, the dynamic viscosity of the medium, Pa · C; (1 - the density of the solid particle, g / cm3; (2 - the density of the medium, g / cm3; H is the height of the particle sedimentation, cm; G - acceleration of gravity, m / s2;

$$d_э = \sqrt[3]{\frac{6V}{\pi}} = 1{,}24\sqrt[3]{\frac{M}{\rho}}, \quad (9)$$

where V is the volume of the particle, M3. As part of the captured mass contain various impurities (sand, earth, stones) with various sizes (within 10 ÷ 500 microns). To determine the size and mass of the particles, we conducted a series of experiments.

IV. EXPERIMENTAL RESULTS

Before determining the sizes of caught solid particles of mechanical impurities, they were dried into the furnace of the brand - SNOL 1,6.2,5.1 / 11-И2 for 1-2 hours at a temperature of 100-150.

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Table 1
Sizes and weight of solid particles in the structure of the captured mass

Name of solid particles	*Particle size, μm*							
	500	400	325	270	200	100	50	10
	Mass of particles, g							
A rock	0,0045	0,0017	0,00067	0,00030	0,00027	0,00016	0,00011	0,000097
Land	0,00175	0,00170	0,00021	0,00007	0,00005	0,00001	0,000009	0,000006
Sand	0,0030	0,0023	0,0015	0,0004	0,0003	0,0001	0,000087	0,000054

Table 1 shows that the oil sludge contains various solid impurities, such as stone, earth, sand, etc. The mass of fine solid particles of the stone in the composition of the oil sludge with a size of 10 μm to 500 μm will change in the range of 0.0045 ÷ 0.000097 g, and the Earth is in the range of 0.00175 ÷ 0.000006 g

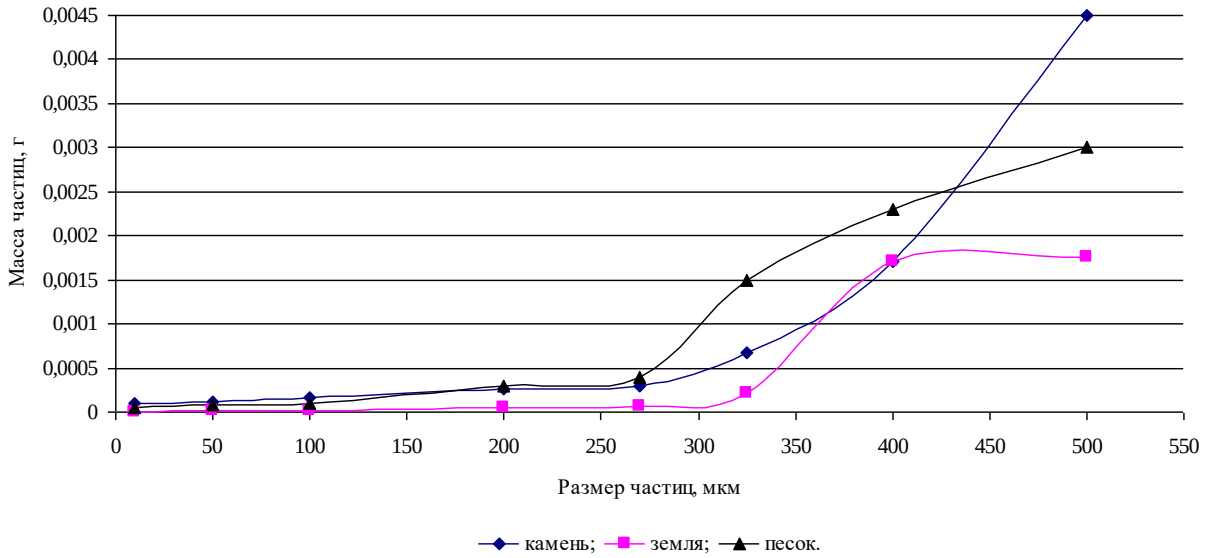

Figure 1. Determination of solid particles depending on their size

Figure 1 shows that with an increase in the size of solid particles of mechanical impurities, their mass also increases, i.e. The mass of 10 μm particles is 0.000097 g, the mass of 50 μm particle is 0.00011. With a further increase in the size of solid particles up to 500 μm, their mass was 0.0045, after determining the size and mass of solid particles The results of the studies on the definition of the value of the separation factor are shown in Table 2.

Table 2
The values of the rate of free deposition of single solids in centrifugal and gravitational fields

Particle size, *m* × 106	Free deposition rate in gravitats.phol, m / s	The rate of deposition in the centrifugis.Field, m / s	Separation factor, cr	The values of the rate of free deposition of single solids in centrifugal and gravitational field Arkhimed
10	0,00095	1,55	1630,98	18,1
50	0,001	1,76	1630,98	20,1
100	0,0015	2,56	1630,98	29,5
200	0,0026	4,32	1630,98	50,22
270	0,0029	4,80	1630,98	56,09
325	0,0065	10,72	1630,98	98,1

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400	0,016	27,20	1630	269,1
500	0,044	72	1636	784,8

From Table 2, it can be seen that 10 μm of particles in the gravitational field is deposited in 0.00095 m / s, and in the centrifugal field is 1.55 m / s, the rate of deposition of 50 μm particles in the gravitational field is 0.00 The sections of the Criminal Procedure for such particles is almost the same, i.e. This indicator is an average of 1631,485. The results of the studies are also illustrated in Fig.2.

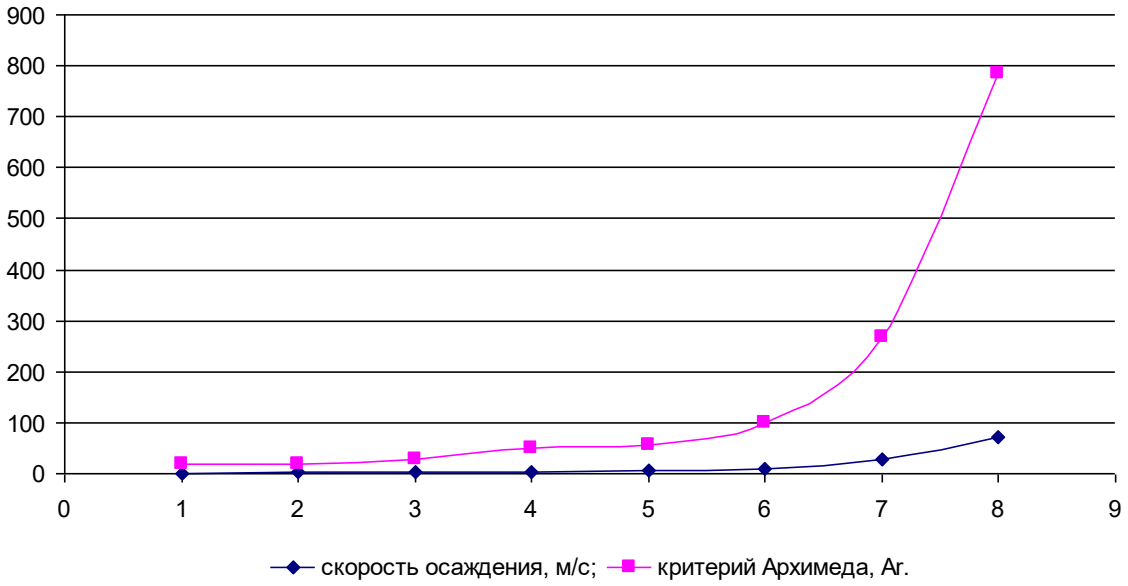

Fig.2. Change the criterion of the Archimedes depending on the rate of precipitation of solids in the centrifugal field

Fig. 2 shows that the criterion of Archimead AR also varies depending on the mass of the particle within 18.1 ÷ 784.8. This is due to the fact that with an increase in the mass of solid particles of mechanical impurities, their deposition speed is also accelerated in gravitational and centrifugal fields. At the same time, the sections of the Kyrgyz Republic remains almost unchanged, and the criterion of Archimead AR varies depending on the mass of solid particles.

V. CONCLUSION AND FUTURE WORK

Thus, studies indicate that the separation factor for cleaning the oil sludge from mechanical impurities was an average of 1631.485 in various sizes of solid particles from 10 μm to 500 microns, and the criterion of Archemical This is explained by the fact that in the centrifugal field at high speed of the liquid flow of resistance of the medium (the force of ArchimedeAr) on the separation of solids is almost impermanent, i.e. It is advisable to use the hydrocyclone when cleaning the diluted oil sludge.

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