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OPTIMIZATION OF GATHERING, TRANSPORTATION, AND PREPARATION PROCESSES FOR WELL PRODUCTION

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ABSTRACT

Since oil and gas and gas-condensate reservoirs in fields consist of rocks such as sand, sandstone, limestone, dolomite, etc., the produced fluid contains aggressive solid particles of these rocks. The oil and gas composition includes formation water with high corrosive potential, containing components such as calcium chloride, sodium bicarbonate, magnesium chloride, sodium sulfate, etc. The presence of solid sand-clay mixtures and saline water in the collected and transported product leads to the erosion of technological equipment and premature failure of the working parts of pumps. To separate liquid and gas, the product often enters oil-gas separators with pulsations, which reduces the quality of gas separation from the liquid. Most of the sand-clay mixture coming from the wells reaches the water and oil collection tanks at the oil gathering stations and settles at the bottom. Cleaning the bottom sediments of existing tanks requires significant time, labor, and machinery, and exposes the environment to environmental pollution . When draining the water beneath the oil layer, oil is discharged out along with the water, leading to oil losses. To dampen pulsations in the oil-gas flow, a device should be installed at the inlet of the oil-gas separators to ensure the separation of sand-clay mixtures and the stabilization of surges. To drain the water under the oil and clean the tanks from salt and sand-clay sediment, the tank bottoms should be designed with a 1:30 concave conical ratio, and a drainage pipe should be placed at the center of the bottom.

Keywords: formation water; sand-clay mixtures; gas-oil-water mixture separator; settler; oil trap; oil suspension; emulsion; viscosity; Reynolds number; Stokes' law; separator; sand trap.

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1. Introduction

Oil and gas are accumulated within the pores and fractures of sand, sandstone, limestone, and dolomite rocks [1]. The produced oil and gas contain water such as calcium chloride, sodium bicarbonate, magnesium chloride, sodium sulfate, etc., which possess high corrosive potential. Sand-clay mixtures [2] and water with high salt concentrations create complications during production [3], collection, transportation [4], processing, and storage [5] of oil and gas; specifically, they cause premature failure of tubing, valves, pipelines, and technological equipment in the wells. Sand-clay mixtures can also form plugs at the wellbore bottom and within the lifting string. This leads to an increase in complications [6], corrosion control measures, and maintenance costs [7]. Environmental protection is the most critical issue in the exploitation of natural resources. To this end, reconstruction work has been carried out—and is currently ongoing—in most oil and gas extraction, collection, transportation, and processing systems that do not meet ecological requirements.

If the pressure of the produced fluid in the well discharge lines is higher than the pressure in the oil-gas transmission pipeline, the product (a mixture of gas-oil-water-sand) is transferred directly to the pipeline; if it is lower, it is collected in vessels located at the well site [5]. Gas is separated from the product collected in these vessels and transferred to the low-pressure gas collection system [8]. When the liquid reaches a designated high level in the vessels, pumps are automatically activated to inject the liquid into the pipeline, and the injection stops when it reaches the low level [9]. In the extraction, collection, transportation, and processing of oil, it is possible to reduce viscosity and partially eliminate complications by using surfactants [10, 11]; however, it is not possible to eliminate the consequences of sand through this method. Table 1 presents the granulometric composition of sand sampled from the gas-liquid transmission pipeline of Deep Water Platform (DWP) No. 4 in the "Guneshli" field. The transported liquid can contain up to 3 grams of sand-clay mixture per liter.

Experimental studies conducted over many years at the "Oil Rocks" (Neft Dashlari), "Guneshli", "Palchig Pilpilasi" (Mud Volcano), "Sangachal-Duvanni", and other fields have shown that the entry of solid particles into the intake of the pumps leads to premature failure of their working parts and the formation of leaks in the pumps [5]. To prevent these

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occurrences, solid particles must be trapped at the inlets of collecting vessels and in the intake lines of the pumps. Despite various measures taken in oil and gas-oil fields, as well as in wells [1, 2], it has not yet been possible to completely prevent the presence of sand-clay mixtures [6, 7] in the produced fluid.

To ensure that the production from the wells does not decline [12-14], the well product is transported small-scale oil gathering stations located at intermediate points or to consolidated separation units. At these intermediate points, gas is separated from the incoming product and sent to the low-pressure collection system, while the liquid is pumped to the Central Oil Gathering Station (COGS). Here, the presence of solid particles in the liquid significantly reduces the operational lifespan of the pumps [5]. Therefore, solid particles must be trapped at the inlets of collection vessels and in the intake lines of the pumps.

At the COGS of most Oil and Gas Production Departments (OGPD), the oil and water are initially separated [13, 15] from the well product, which passes through last separators and enters settling tanks, and then collected in respective tanks.

In water collection tanks, oil suspensions rise above the formation water due to gravity, creating an oil layer, while salt and sand-clay mixtures settle to the bottom [4, 15]. The oil layer accumulated on top of the water is injected into a drainage vessel via an outlet line installed at the upper part of the tank. In oil collection tanks, water, salt, and sand-clay mixtures are separated from the oil by gravity and settle to the bottom. Depending on the diameter, the inlet and outlet lines of the tanks are located at a distance of 300–500 mm from the bottom. To inject the water, salt, and sand-clay mixtures from beneath the gravity-separated oil in existing tanks into the drainage vessel, a vent valve with a diameter of DN 50 or 80 mm and a cleaning pipe with a diameter of DN 150 mm are installed.

It should be noted that tank bottoms are typically constructed with a convex conical ratio of 1:50 or 1:100. At COGS, oil and water collection tanks with volumes of 1000, 2000, 3000, and 5000 m^3, with internal diameters of 10.43, 15.18, 18.98, and 22.80 m, respectively are most used [16]. Since the siphon valve and the cleaning pipe are located on one side of the tank shell, it is impossible to achieve complete removal of bottom sediments. Experimental studies have shown that over time, the bottoms of existing tanks fill up with salt and sand-clay sediments up to the level of the inlet-outlet lines. The aggressive formation water (brine) and salt-sand-clay mixtures settled at the bottom cause rapid corrosion and shorten the lifespan of the tanks. Therefore, tanks must be cleaned of bottom sediments 3-4 times a year. Cleaning tanks of aggressive bottom sediments [17] is a complex technological process that requires significant time, labor, manpower, and machinery [18]. Furthermore, the effectiveness of anti-corrosion measures remains low.

2. Problem statement

Long-term experimental studies have demonstrated that pulsations occurring within the oil and gas stream during extraction and transportation impede the efficient separation of gas, liquid, and solid particles in separators. To partially mitigate these complications, solid particles should be captured at oil-gas production sites and intermediate gathering points, while pulsations must be dampened at the inlets of technological equipment. To dampen these pulsations and separate the bulk of the sand, a vertical vessel should be installed upstream of the oil-gas separator (fig. 1).

Table 1

Granulometric composition of the sand sampled from the liquid-gas transmission line of Deep Water Platform (DWP) № 4

Solid particle diameter, mm	Fractional composition, %
> 0.425	2.18
0.425 ÷ 0.180	30.85
0.180 ÷ 0.106	49.56
0.106 ÷ 0.090	9.15
0.090 ÷ 0.075	4.26
0.075 ÷ 0.045	3.47
< 0.045	0.53

The inlet and outlet pipes of the vessel are positioned in the intermediate sections of the shell. Inside the vessel, the inlet pipe diverts the flow downward at a 90° angle, terminating near the bottom. A safety valve and instrumentation (I&C) and control are installed at the top of the vessel, while a drainage line is located at the bottom for the discharge of salt, sand, and clay mixtures. Under the influence of centrifugal and gravitational forces, coarse solid particles separate from the incoming gas-oil-water-sand mixture and settle at the bottom [19, 20], while the product exits through a line installed in the middle section of the shell and is transported to the oil-gas separator.

Within the vessel, a portion of the gas separates from the product and accumulates in the upper headspace, forming a gas cap. Since gas is a compressible medium, when the product enters the vessel with pulsations, the liquid level rises slightly, compressing the gas phase. Subsequently, due to the gas pressure, the elevated liquid level is restored to its original position. Thus, pulsations are significantly dampened by the energy of the compressible and expandable gas cap. The separated salt, sand, and clay mixtures are discharged into sand traps (ST) by opening a gate valve on the drainage line. These sand traps consist of removable stepped containers; as the water-sand-clay mixture passes through them, the solids settle, and the overflowing water flows into the drainage tank (DT) [4, 15].

The oil-gas separator is also equipped with appropriate control instrumentation [9]. The gas separated in the separator is delivered to the low-pressure gas gathering system, while the liquid is pumped to the central oil gathering point. For this purpose, a shut-off valve is installed at the liquid outlet of the separator; when the liquid reaches a predefined high level, the valve opens and the pump starts automatically. When the liquid drops to a predefined low level, the pump stops and the valve closes [9]. A strainer is installed between the shut-off valve and the pump to capture coarse solid particles. Experimental studies have shown that it is impossible to completely separate sand-clay mixtures from the gas-oil-water flow in a single stage within any given device.

Consider that the settling process of solid particles with density ρ_s within a gas-liquid medium of density ρ_m inside the vessel, where $\rho_s > \rho_m$. Solid particles enter the vessel with the gas-oil-water mixture at an initial velocity $\upsilon_1 = Q / F$ (m/s), where: Q is the volume of the mixture at a given pressure and temperature (m^3/s); F is the internal cross-sectional area of the inlet pipe (m^2). According to d'Alembert's principle [21], the force balance acting on a solid particle [22] can be expressed by the following equation (fig. 1b):

$$\vec{F_s} + \vec{F_g} - \vec{F_A} - \vec{R_d} = 0 \quad (1)$$

where:

F_g – is the gravitational force acting on the solid particle, assuming it as a sphere with diameter d, $F_g = mg = \frac{\pi d^3}{6}\rho_s g(N)$;

F_A – is the buoyancy force acting to lift the solid particle in the gas-oil-water medium, $F_A = \frac{\pi d^3}{6}\rho_m g(N)$;

R_d – is the drag (resistance) force acting on the cross-sectional area of the particle,

F_c – centrifugal force affecting the particle, $F_c = m\frac{d\upsilon_1}{d\tau} = \frac{\pi d^3}{6}\rho_s \frac{\upsilon_1^2}{R}(N)$;

m – is the mass of the solid particle;

υ_s – is the settling velocity of the solid particle, m/s;

ξ – is the drag coefficient [23], and if Reynolds number $R_e \le 2$ (laminar flow) if $2 < R_e < 500$ (transitional flow), equation is used; if $R_e > 500$ (turbulent flow) where it remains practically constant and

τ – time, sec;

R – is the radius of curvature of the elbow through which the gas-oil-water mixture enters the vessel (m).

By substituting these expressions into Equation (1), obtain the following for the settling velocities of solid particles:

$$\upsilon_s = 2\sqrt{\frac{d\left[\rho_2 \frac{\upsilon_1^2}{R} + g(\rho_s - \rho_m)\right]}{3\xi\rho_m}} \quad (2)$$

Experimental studies conducted at oil storage tank areas have shown that it is impossible to clean existing tanks of aggressive salt and sand-clay sediment mixtures. The siphon taps and cleaning pipes installed in the tank shells cannot cope with this task. When injecting the settled water from beneath the oil in these tanks, a small amount of oil inevitably flows out along with the water.

To facilitate the easy removal of bottom sediments and water, a design featuring a conical concave bottom with a 1:30 ratio has been proposed [15]. A sump with a diameter of 1000 mm and a depth of 550 mm is provided in the center of the bottom. A drainage pipe with a diameter of DN 150 mm is laid from the center of the sump, passing through the tank base with a 1:100 slope. A gate valve is installed on the section of the drainage pipe exiting the tank base, and the pipe is connected to a manifold leading to a sand trap. Since there is no movement (stagnation occurs) below the inlet-outlet lines of the tank, the complete separation of water and sand-clay mixtures from the oil is ensured.

Because the tank bottom is constructed as a 1:30 conical depression, sediments move towards the center. By opening the valve on the drainage pipe, the bottom sediments are injected into the sand trap along with the water. In this case, no oil particles passing with the water, and the oil and water collection tanks are regularly (daily) cleaned of aggressive salt and sand-clay sediments. During the construction of the Central Oil Gathering Station (COGS) of the "Absheronneft" OGPD, the tank bottoms were built with this conical concave design [15].

Experimental studies conducted after the tanks were commissioned showed that they are very easily cleaned of bottom sediments and water. If the interior needs washing, there is no need for personnel to enter the tank. By opening the hatches on the tank shell, personnel can remain outside and completely wash the interior using water jets through the hatches. Since the bottom is conical, any stuck sediments are broken up by the jet, directed to the center, and discharged through the drainage line to the sand traps. These studies confirmed that a conical concave bottom and a central drainage pipe ensure complete cleaning of bottom sediments and the water layer [15].

The disadvantage of the conical concave bottom design is that the slope begins from the outer edge toward the center at a 1:30 ratio. When viewed from the outside, an acute angle is formed between the tank shell and the bottom, where rainwater accumulates. Because of this design, rainwater can penetrate underneath the tank bottom.

To eliminate these drawbacks, a structural change in the construction of the tank bottom is proposed. During construction, a reinforced concrete ring is prepared under the wall sections. Starting from the outside of the bottom to the internal diameter of the reinforced concrete ring, the bottom is constructed with a 1:200 conical convex slope, followed by a 1:30 conical concave slope toward the center. In the central part of the bottom, a DN 400 mm to DN 200 mm reducer is installed, with a DN 200 mm elbow underneath, followed by a DN 200 mm drainage pipe passing through the tank foundation at a 1:200 slope (fig. 2). A gate valve is installed on the drainage pipe outside the tank bunding.

In this case, an obtuse angle is formed between the tank shell and the wall on the outside; therefore, rainwater cannot accumulate in that area, flows away from the foundation, and cannot penetrate under the bottom.

When a sump is in the central part of the bottom, aggressive salt, sand, clay, and water remain stagnant in the space below the drainage pipe, which accelerates corrosion in that area. In the proposed structural change, however, the use of a reducer and an elbow creates a continuous movement of water, salt, and sand-clay mixtures within the tank, which reduces the corrosion rate.

Various technological schemes are used for the separation of oil, water, and sand in existing oil storage tank farms. At the Gathering Station of the "May 28" OGPD on Chilov Island, settlers are used after the separator. In these settlers, water and sand-clay mixtures are separated from the oil; the oil separated from the upper part is sent to collection tanks, while the sand-clay mixture and water are injected into oil traps. In the oil traps, water, oil, and sand-clay are separated again. Water is taken from the middle section of the trap via piston pumps and sent to water collection tanks, while oil from the top section is pumped to the collection tank. The oil trap is periodically cleaned of accumulated salt and sand-clay using hydro-elevators. In this separation variant, a larger amount of oil flows out with the water-sand-clay mixture, leading to additional oil losses during subsequent collection and pumping, and the environment is exposed to oil waste pollution.

At the "Dashgil" Central Oil Gathering Station of the "N. Narimanov" OGPD, the gas-oil-water-sand-clay mixture from the production shops passes through oil-gas separators and enters a last separator installed at a height of 12–14 m. There, residual dissolved gas is separated from the oil-water mixture, and the oil-water flows by gravity to a surge tank. In the surge tank, water and oil are separated from the emulsion and transported to respective tanks. Using a surge tank for oil-water separation is more efficient than using settlers because it ensures better separation. The difficulty here lies in the separation of sand-clay mixtures.

The OGCU in the Buzovna field of the "H.Z. Taghiyev" OGPD was built and commissioned in April 2011. Two inclined pipe-type gas-oil-water-sand separators (diameter 1220 mm, length 32 m, working volume $V = 36$ m³) were used for the primary separation and collection of incoming mixtures. These separators are installed at a 60° angle relative to the horizontal plane.

Respective outlets are provided for the injection of gas, oil, water, and sand-clay. All technological processes are closed-loop. Notably, some wells are operated by deep-well pumps and others by the airlift method. One separator receives product from deep-well pumps, and the other from airlift wells. Experimental studies showed no issues with products from deep-well pumps; gas, oil, water, and sand-clay separation was highly efficient. However, for airlift wells, the high gas content and pulsating flow made separation less effective. To increase efficiency, an oil-gas separator should be installed before the separator to remove gas. Instead of oil traps, closed sand traps and drainage tanks were used; sand-clay mixtures from the separator are discharged into container-type sand traps where salt and sand-clay settle, while water overflows into the drainage tank (fig. 1). The liquid in the drainage tank is then pumped back to the separator inlets.

At the Buzovna OGCU, problems also arise in cleaning bottom sediments because the tank bottoms were constructed with a conical convex design.

At the "Apsheronneft" OGPD OGCU, vertical gas-oil-water-sand separators (height 10 m, volume 46 m³) are used. These separators have lines for discharging gas, oil, water, and sand-clay. A disadvantage is the lack of an external chamber for Instrumentation and Control (I&C) to maintain the oil-water interface level. Since the sensor probe is inserted directly into the separator, it vibrates due to pulsations, reducing accuracy and making it difficult to maintain a stable interface.

In the "Oil Rocks" (Neft Dashlary) area of the "May 28" OGPD, well products from the "Gunashli" field platforms pass through oil-gas separators in large-scale separation units, then through a final separator at a 16 m height, and flow by gravity into a 3000 m³ surge tank. High-level oil-water separation occurs there. The main issue is the failure to clean the tanks of settled sand-clay mixtures. The sand-clay mixture from the surge tank enters the water collection tank and subsequently the pump inlets, eventually being injected into water injection wells. This causes rapid wear of pump components and clogs the injection wells. Various separation devices used after the surge tank failed to operate long-term due to the high sand volume. Filters used on the pump suction lines also fail to provide long-term, complete removal of sand-clay mixtures.

Experimental studies at existing gathering stations have shown that using oil-water-sand tanks after the final separator is highly efficient for better oil-water separation (fig. 3). The oil-water interface in the surge tank remains stable due to the siphon effect used in the water collection line.

These studies confirmed that constructing the bottoms of surge, oil, and water collection tanks with a conical concave design and a central drainage pipe through the base allows for easy removal of sediments.

To allow small-sized sand-clay mixtures to settle to the bottom, two collection tanks should be used, and these tanks must be kept in a stagnant state for 8–10 hours to ensure that the fine particles can settle.

Installing a vessel (fig. 4) upstream of the oil-gas separators to dampen pulsations and ensure the separation of sand-clay mixtures further increases efficiency.

3. Results and discussion

Since the productive strata of oil and gas fields consist of sand, sandstone, limestone, and dolomites [1, 2, 11], it is natural for the wellbore fluids to contain solid particles [5, 7]. The product from low-pressure oil and gas wells is separated at the wellhead platforms; the gas is delivered to the low-pressure collection system, while the liquid is pumped into the oil-gas transportation pipeline [4, 5].

When the gas-liquid-sand mixtures enter the vessel

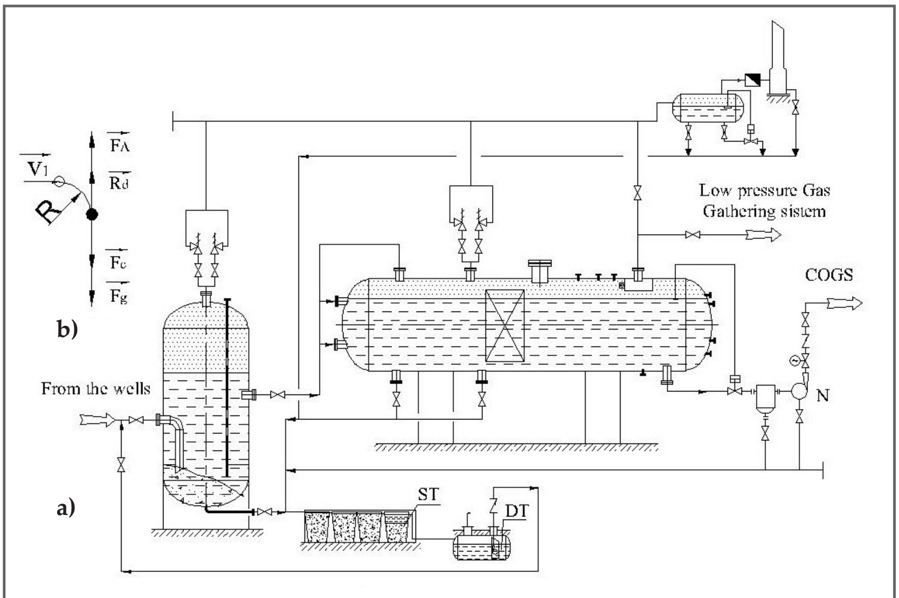

Fig. 1. a) Schematic diagram for pulsation suppression and solid particle trapping in the separation system; b) Settling scheme of solid particles

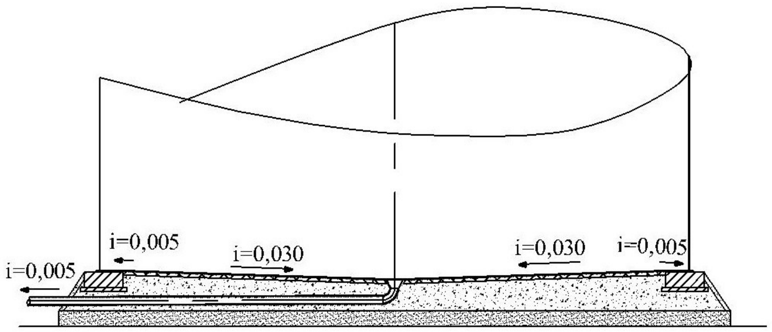

Fig. 2. Proposed tank bottom construction

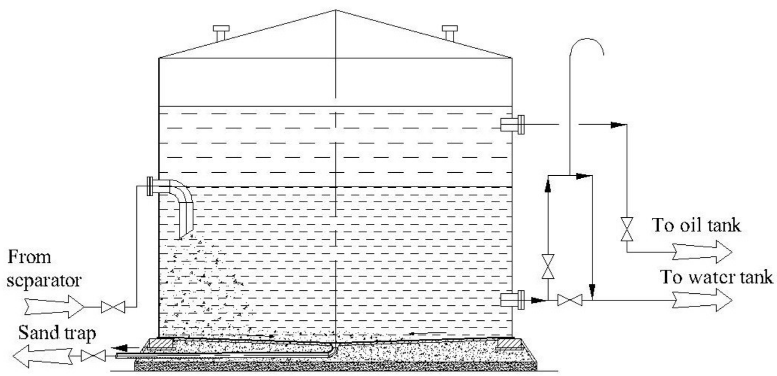

Fig. 3. Proposed surge tank construction

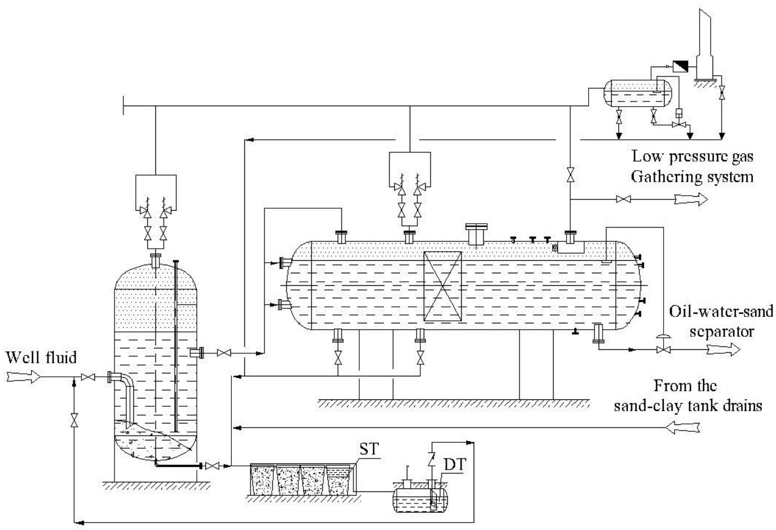

Fig. 4. Schematic for pulsation dampening, sand, and gas separation at the inlet of the tank

(unit) designed for pulsation dampening and sand-clay separation, large solid particles settle to the bottom under the influence of centrifugal and gravitational forces [23]. In addition to the centrifugal force F_c and gravitational force F_g acting on a settling solid particle, the Archimedes' force F_A and resistance force R_d also exert influence [24]. Based on formula (1), when $F_c + F_g = F_A + R_d$, the particles remain in a suspended state within the separator, when $F_c + F_g > F_A + R_m$, the particles settle to the bottom, and when $F_c + F_g < F_A + R_d$ the particles exit the separator with the liquid-gas flow. From the equilibrium condition in formula (2), the minimum particle size for remaining in a suspended state within the pulsation dampening and sand-clay separation unit is:

$$d_{\min} = \xi \frac{3\rho_m \upsilon_s^2}{4\left[\rho_s \frac{\upsilon_1^2}{R} + (\rho_s - \rho_m) g\right]} \qquad (3)$$

Particles with dimensions larger than d_{min} – settle to the bottom, while smaller particles exit the separator with the gas-liquid flow. This leads to the conclusion that regardless of how many sand separators are used in the gas-liquid transport line, dust-like particles exit the separator, continue moving with the flow, and eventually enter the oil and water collection tanks as solid particle mixtures composed of sand and clay.

Various demulsifiers are used to break down the oil-water emulsion [25]. As a result of the emulsion breaking, salt, water, and sand-clay solid particles separate and settle to the bottom [19, 20]. When the product is kept in a stagnant state in the oil and water collection tanks, the equilibrium equation for the solid particles is [23, 22]:

$$\overrightarrow{F_g} - \overrightarrow{F_A} = \overrightarrow{R_d} \qquad (4)$$

here $F_g - F_A = \frac{\pi d^3}{6}(\rho_s - \rho_m)\, g;\quad R_d = \xi \frac{\rho_m \upsilon_s^2}{2}\frac{\pi d^2}{4}$ equations are used. In the stagnant state of the collection tanks, since there is no movement, the Reynolds number is less than 1 and according to Stokes' law, it is calculated using the equation $\xi = \frac{24}{R_e}$ [23, 19, 24]. Since the Reynolds number is calculated as $R_e = \frac{\upsilon_s d \rho_m}{\mu}$, the resistance force is $R_d = 3\pi d \mu \upsilon_s$, where μ is the dynamic viscosity of the medium. From equation (4), we obtain the following equation for the settling of sand-clay mixtures:

$$\upsilon_s = \frac{d^2}{18\mu}(\rho_s - \rho_m)\, g \qquad (5)$$

It should be noted that since the medium for the settling of solid particles is water, the dynamic viscosity is $\mu = 1.3 \cdot 10^{-3}$ Pa·sec at 10 °C, $\mu = 1.0 \cdot 10^{-3}$ Pa·sec at 20 °C. Let's examine the settling velocity at 10 °C in the collection tanks for a solid particle with a density of $\rho_b = 1500\ \text{kg/m}^3$, and a size of $d = 0.05 \cdot 10^{-3}$ m. Since solid particles primarily settle in a water medium, the formation water density $\rho_m = 1030\ \text{kg/m}^3$. Then the settling velocity of the solid particle is:

$$\upsilon_s = \frac{(0.05 \cdot 10^{-3})^2}{18 \cdot 1.3 \cdot 10^{-3}}(1500 - 1030)\, 9.81$$

The velocity is $\upsilon_s = 0.492$ mm/sec and solid particles with a size of $d = 0.05 \cdot 10^{-3}$ m can descend up to 1.7 m in one hour. As seen from the calculation, the lower the medium temperature and the smaller the solid particle size, the lower their setting velocity. Experimental studies have shown that if the bottoms of the collection tanks are constructed as a conical concave and a drainage pipe is passed from the center of the bottom through the base, all settled aggressive salts and solid particles can be removed from the tank.

Conclusions

1. To capture sand-clay mixtures and dampen pulsations, a pulsation dampening and sand separation vessel should be installed upstream of the separators.

2. The use of a surge tank is more efficient for achieving better separation of oil, water, and sand at oil gathering stations.

3. To facilitate the easy cleaning of tanks from aggressive salt and sand-clay bottom sediments and to prevent rainwater from penetrating beneath the tank, the bottoms should be constructed with a 1:200 conical convex slope from the outer edge to the inner diameter of the reinforced concrete ring, followed by a 1:30 conical concave slope toward the center. Additionally, a drainage pipe should be installed from the center of the bottom, passing through the tank foundation using a reducer and an elbow.

References

1. Suleimanov, B. A., Abbasov, H. F., Ismailov, Sh. Z. (2024). A comprehensive review on sand control in oil and gas wells. Part II. Chemical treatment and sand management. *SOCAR Proceedings*, 4, 27-41.

2. Kazimov, Sh. P., Mehdiyev, K. K. (2020). Acıd-based cement slurry wıth controllable propertıes. *SOCAR Proceedings*, 3, 47-51.

3. Suryantoro, R. W., Siallagan, M. P. S. (2025). Increasing lifetime of tubing pump with sand problem in Field X Zona 1 Pt Pertamina EP. *European Journal of Business and Management Research*, 10(2), 112-123.

4. Bayramov, S. B., Abbasov, Kh. F., Huseynov, Sh. Sh., et al. (2017). Retention of mechanical impurities in the collection and transportation system of oil wells. Azerbaijan Oil Industry, 3, 40-42.

5. Bayramov, S. B., Guliyev, M. F., Mammadov, T. N., et al. (2014). The separation of oil, water, gas and sand from the well product. *Azerbaijan Oil Industry*, 1, 37-41.

6. He, X., Pang, Z., Ren, L., et al. (2024). A critical review on analysis of sand producing and sand-control technologies for oil well in oilfields. *Frontiers in Energy Research*, 12.

7. Zhiliang, W., Zhenhua, W., Zhensong, W., et al. (2025). Study of sand particle transport characteristics and different critical velocities in sand-producing wells via indoor experiments. *Scientific Reports*, 15(1), 9707.

8. Gurbanov, A., S., Damirova, J. (2025). Study of dynamic analysis of separation devices in gas drying. In: *III International Conference on Advances in Applied Physics and Mathematics for Energy, Environment and Earth Science (AAPM-III 2025), EPJ Web Conf.*, vol. 318.

9. Safarova, A., Damirova, J., Huseynov, I. (2023). Development of adaptive control system for technological facility of primary oil refining. *EUREKA: Physics and Engineering*, 5, 80-93.

10. Suleimanov, B. A., Veliyev, E. F., Vishnyakov, V. V. (2022). Nanocolloids for petroleum engineering: Fundamentals and practices. *John Wiley & Sons*.

11. Suleimanov, B. A., Abbasov, E. M., Sisenbayeva, M. R. (2017) Mechanism of gas saturated oil viscosity anomaly near to phase transition point. *Physics of Fluids*, 29, 01206.

12. Shaimardanov, V. Kh. (2013). Processes and equipment for oil and gas collection and preparation technologies in the fields. *Moscow-Izhevsk: Institute of Computer Research*.

13. Savelyeva, N. N. (2019). Improvement of technological equipment for the wellbore production collection and preparation system. *Modern High Technologies*, 2, 138-142.

14. Savenok, O. V., Diomande, B. Kh. (2020). Characteristics of the wellbore production collection and preparation system at the Block 63 offshore field. *Bulatov Readings. Collection of Articles* – 2020, 47-57.

15. Ismailov, F. S., Gasanov, F. G., Bayramov, S. B., Nasibova, A. A. (2014). Improvement of process equipment at an oil collection point. *Oilfield Business*, 4, 56-59.

16. GOST 31385-2016. (2016). Vertical cylindrical steel tanks for oil and oil products. *Moscow: Standartinform*.

17. Babakin, A. D. (2023). Modernization of the process of erosion of bottom sediments in the reservoirs of the RVSP 20000. *Problems of Collection, Preparation and Transportation of Oil and Oil Products*, 6(146), 112-122.

18. Gilmiyarov, E. A., Gruzdeva, I. V. (2019). Methods of mechanical cleaning of tanks from bottom sediments. *Bulatov Readings. Collection of Articles* – 2019, 151-153.

19. Potapov, I. I., Reshetnikova, O. V. (2024). On modeling the problem of solid particle sedimentation in a viscous incompressible fluid using the smoothed particle hydrodynamics (SPH) method. *Proceedings of the ISP RAS*, 36(4), 191–202.

20. Arkhipov, V. A., Usanina, A. S. (2017). Gravitational sedimentation of a highly concentrated system of solid spherical particles. *Thermophysics and Aeromechanics*, 5, 739-750.

21. Manzhosov, V. K., Novikova, O. D., Novikov, A. A. (2011). Theoretical mechanics. Part II. Dynamics. Analytical mechanics. *Ulyanovsk: Ulyansk State Technical University.*

22. Vedernikova, M. I., Startseva, L. G., Gindulin, I. K. (2023). Hydromechanical processes. *Ekaterinburg: USLTU*.

23. Girolami, L., Risso, F., Amin, A., et al. (2024). Sedimentation of short-lived fluid-solid suspensions. *Physics of Fluids*, 36(11), 113308.

24. Babenko, A. P., Strelets, I. V. (2013). Hydraulic size, as the main characteristic in calculating sump. *Internet Journal "Construction of Unique Buildings and Structures"*, 6(11), 34-42.

25. Aga-zade, A. D., Gasanov, H. I., Samedov, A. M., et al. (2020). Destruction of water-oil emulsion with amine-containing composites. *Bulatov Readings. Collection of Articles* – 2020, 40-42.