Offshore drilling is carried out with a stationary hydraulic structures and floating drilling rigs. By stationary hydraulic structures include trestle platforms, dams, artificial islands and fixed ground platforms installed at great depths.

Machinery and technology of drilling wells with subsea location have some differences from the techniques and technology of drilling on land. In this type of work is especially important to follow the safety and consistency of the drilling process.

In any branch of production in oil extraction or in drilling is not uncommon of emergencies related to bottling hydrocarbons. Available figures on the number of oil spills in Russia don't exist , and is estimated by Greenpeace often spills occur due to damage to pipelines gust towards destruction and property damage . For comparison, in a year in the USA is about leaks 14,900 tons, 17,600 tons in Russia, 7700 tons in Canada. When pipelines is broken up and other situations, effective way in this situation of collecting hydrocarbons is using biosorbents. This direction is the subject of further researching.

Thus, in article were considered methods of utilization of drilling waste, their types, possible prospects of their further using, existing problems on land and on a sea shelf due to drilling, and also there are the direction of further researches is provided.

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EXPERIMENTAL MODELING OF THE FLOW OF OIL-WATER EMULSION WITH POLYMERS ADDITIVES

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Upon dissolution of the polymer occurs in the liquid and a simultaneous increase in the viscosity rate and increase of the turbulent flow of the polymer solution in comparison with the flow rate of the source of low-viscosity solvent. This paradoxical phenomenon is called the Toms effect and is widely used in oil transportation by pipelines. When Toms effect occurs (Fig. 1)it leads to a reduction in the hydrodynamic drag reduction coefficient (λ), entering the equation Darcy-Weisbach (1):

$$\Delta P = \lambda \cdot \frac{\rho \cdot L}{4 \cdot \pi^2 \cdot R_w^5} \cdot Q^2 \quad (1)$$

Decreased λ is accompanied by either increasing the volume flow rate (Q) at a constant predetermined pressure drop ∆ P = const, or by decreasing the pressure loss (∆ P) friction at a constant flow rate Q = const.

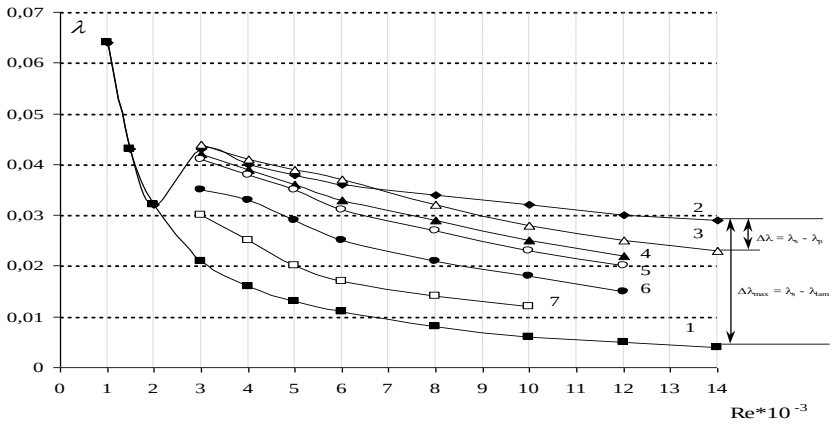

Fig. 1 Dependence of the hydrodynamic resistance with the Reynolds number for different polymer solvent system [1]: 1)Poiseuille theoretical curve for laminar flow *λлам* = 64/Re;
2) Blasius empirical curve for turbulent flow *λтур*=0,3164/Re0,25;
3) Polyisoprene dissolved in toluene solution (*C* = 0,05 *кг/м*3; Mr = 0,5·106);
4) Polyisoprene dissolved in toluene solution (*C* = 0,1 *кг/м*3; Mr = 0,5·106);
5) Polybutadiene dissolved in toluene solution (*C*= 0,1 *кг/м*3; Mr = 0,6·106);
6) Polybutadiene dissolved in toluene solution (*C* = 0,1 *кг/м*3; Mr= 1,2·106);
7) Polyisoprene dissolved in oil (*C* = 0,1*кг/м*3; Mr = 0,5·106).

The magnitude effect of reducing the hydrodynamic resistance (DR,%), which characterizes the energy gain in pumping oil with polymer additives compared with pumping fluid without additives, is calculated by the formula (2) whereλ_S and λ_P - hydraulic resistance coefficient of solvent and polymer solution, respectively:

$$DR,\% = \frac{\lambda_S - \lambda_P}{\lambda_S} \cdot 100\% \quad (2)$$

In the real condition in the wild centrifugal pumps pumping oil through pipelines there is a simultaneous effect occurs:decrease in the pressure drop in the pipe and increase the volumetric flow rate (Fig. 2), when the pipeline is filled with oil-treated polymer additive we notice an increase in Toms effect (Fig. 3).

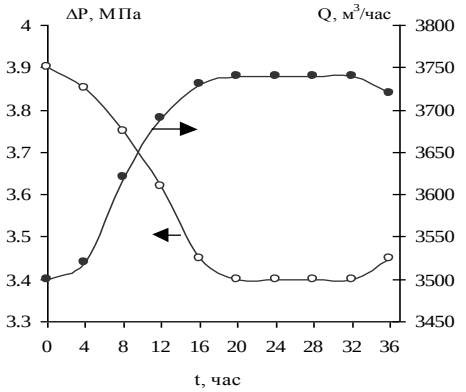

Fig. 2 Changing the pressure drop and flow rate in the pipeline Tihoretsk - Novorossiysk when dosing pipe with the polymer additive [2]

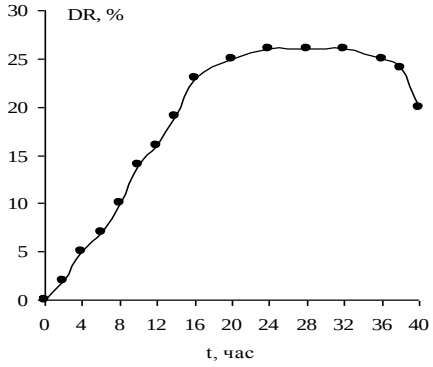

Fig. 3 Changing the magnitude of the Toms effect in the pipeline Tihoretsk - Novorossiysk when dosing pipe with the polymer additive [2]

In our laboratory studies, we conducted a pilot study of the effect of polymer additives on the flowrate of oil-water emulsion.During the in-situ filtration and pumping oil-water mixture throughpipelines may be formed a "direct" emulsions (O / W), like an "inverse"emulsion (W / O), depending on the physicochemical nature of the dispersion medium, we used as water-soluble polymer (polyacrylamide - PAA) and an oil soluble polymer (polyhexene - PH).

The experimental part of the work carried out on turbulent rheometer (Fig. 4), which is structurally simple and similar to the capillary viscometer, but allows the study in the laminar flow regime like in the turbulent regime.

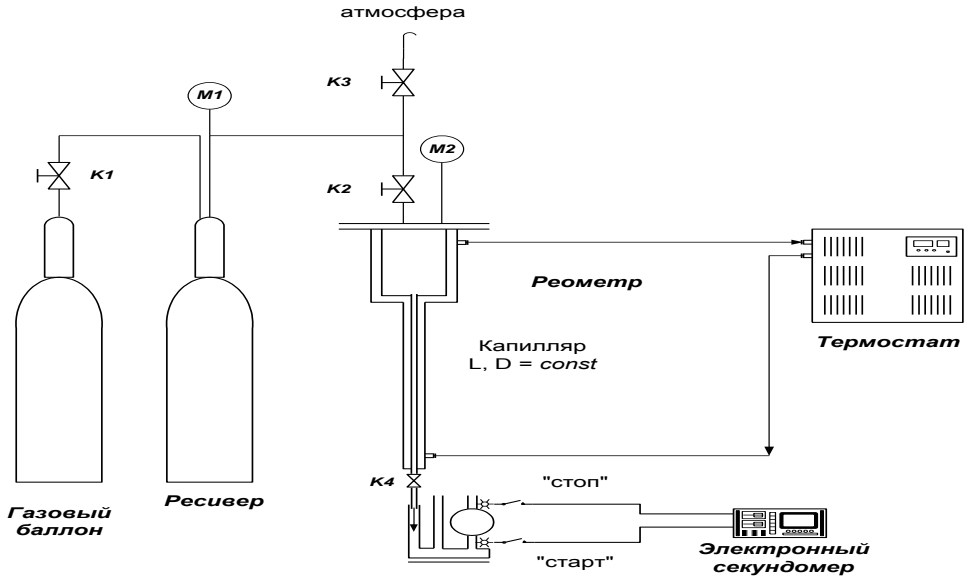

Fig. 4 Turbulent rheometer

Graphic illustration of the dependence of the effect (DR,%) with the concentration of PAA dissolved in water or PH dissolved in benzene is shown in Figures 5 and 6. Analysis of the results presented in the figures shows the view of equality 1 ppm = 1g/m3 = 0.001 kg/m3 that these polymer samples are approximately equal in their anti-turbulenteffectivity, but each of them can only be used in the dispersion medium, certain physical and chemical nature .

Both of these sample in hydrodynamic conditions are typical operating for the pipeline and capable of reducing the resistance by more than 50% at the optimal concentration of SOPT. ~ 10 g/m3.

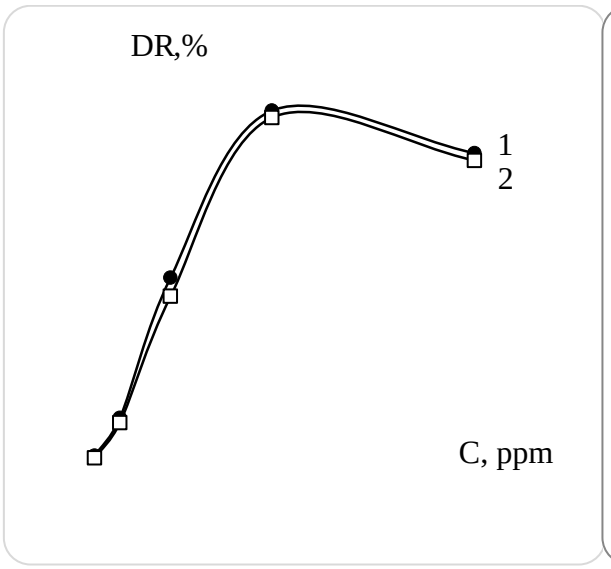

Fig. 5 The dependence of the effect (DR,%) with the concentration (C, ppm) polyacrylamide in water at different shear stresses: 1 – τW = 8 *Па*; 2 – τW = 4 *Па*

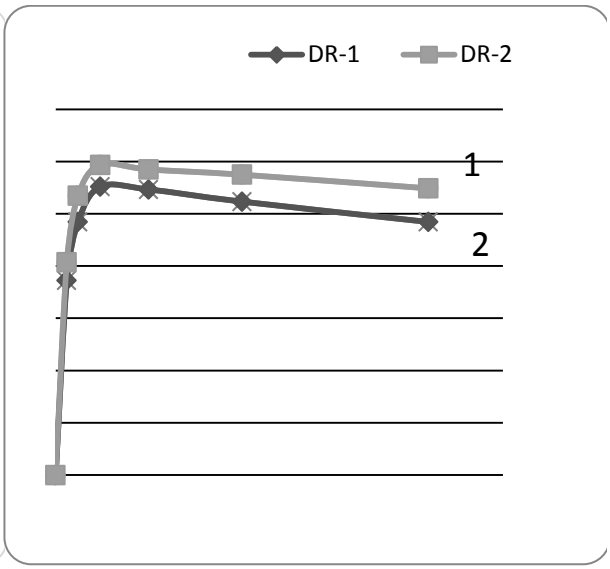

Fig. 6. The dependence of the effect (DR,%) with the concentration (C, ppm) polyhexene in benzene at different shear stresses: 1 - τW = 11 *Па* и 2 - τW = 4 *Па*

But as shown by laboratory tests, if the pumped liquid medium is a two-phase oil-water emulsion, then his hydrodynamic resistance is capable to reduce only the polymer that is compatible with the dispersion medium, i.e. which is soluble in that dispersion medium.

Thus, to reduce the resistance in the "direct"emulsion capable the water soluble PAA (Fig. 7), and in "reverse" emulsions, oil soluble PH (Fig. 8).

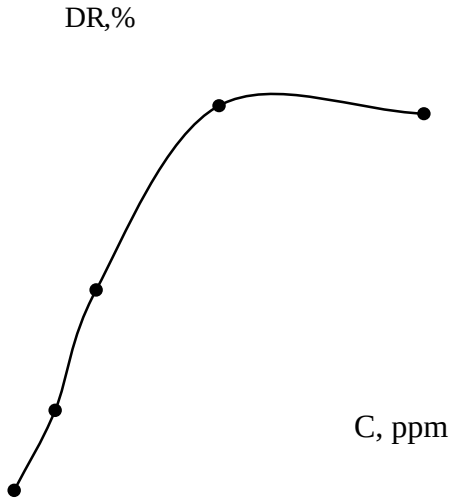

Fig. 7 Dependence of effect DR (%) with the concentration of polyacrylamide in the direct emulsion

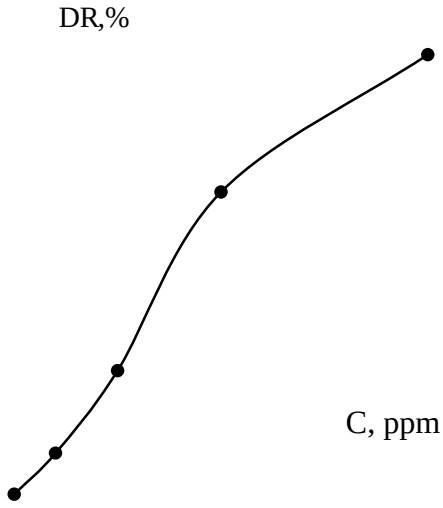

Fig. 8 Dependence of effect DR (%) with the concentration of polyhexene in the reverse emulsion

It should also be noted that in order to reduce hydrodynamic resistance of turbulent flow for oil-water emulsions requires the introduction of a polymeric additive in an amount significantly exceeding its optimum concentration for individual liquids.

This marked increase in the amount of administered polymer due, presumably, the fact that most of it is adsorbed at the interface, i.e. on solvent-adsorption layers micro-emulsion droplets.

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COMPOSITE NANOBIOSORBENT AS A PROMISING MATERIAL FOR AQUATIC ENVIRONMENT TREATMENT FROM RADIONUCLIDES

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High demand in new materials which are capable of permanently eliminating radionuclides comes from the actuality of the problem of environment contamination by radionuclides in general and water environment contamination in particular. Radionuclides occupy special place among agents which contaminate environment components due to their extreme stability and capability to penetrate underground waters, thus, contaminating drinking water reserves. At present clean up of natural and technogenic waters represent a serious ecological problem which exists in many regions of Russia as well as in majority of countries due to many sources of water contamination by radionuclides. The scale of tasks to eliminate the consequences of environment contamination and prevent further pollution demands appropriate efforts to develop sorbent materials and technologies for their application. In particular sorbents must be cheap and mass, while compact leavings which contain radionuclides must be convenient for long term storage, refinement and disposal.

In recent years research on new class sorbent development is actively progressing in many countries, these sorbents should constitute biogenic substances and include them as the main element – biosorbent. For example, they are produced from microbe mass or fungi which are microbiological industry wastes. Apart from that, application of different nanoforms of metal oxides as a sorbent is viewed as promising one.

In spite of the fact that nanotubes and nanopowders have been deeply studied in foreign literature as material for removal of ions of heavy metals there are some implications of using nanoforms of metal oxides as sorbent. Metal nanoparticles can be applied as matrixes for immobilization of plutonium, technetium, uranium and transuranium elements due to their capacity to eliminate radioactive ions accompanied by deformation of nanomaterial, as a result of which caught radionuclides are permanently trapped in the sorbent structure.

Main characteristics of metal nanoparticles plated on mycelium of growing mold fungi are practically no different from the weighted in solution nanoparticles properties. Small fragments of mold mycelium separated from the main culture and transferred to colloidal solution which contains nanoparticles are finally end up being covered by these nanoparticles. Apart from that no prior modification of neither particles nor mold is required for nanoparticles adsorption on the surface of growing mycelium. Final hybrid material represents tube cell of mold fungi covered by several layers of nanoparticles. Deposition of nanoparticles on mold is not accompanied by their aggregation with each other.

The aim of our research is to develop new effective, composite and safe sorbent, and as component of which we plan to use metallic nanotubes, concretely metal oxide nanomaterials, and modified by this nanomaterials fungi. The prerequisites for metal nanoparticles using are hypotheses that state - the metal nanoparticles can be used as matrices for immobilization of plutonium, technetium, uranium and transuranic elements due to the ability to absorb radioactive ions while the deformation process of the nanomaterial takes place [2]. As a result, the absorbed radionuclides are permanently enclosed in the structure of the sorbent [3].

For the research the nanopowders of cupric and iron oxides, obtained by electrical explosion of cupric wire in air, nanopowder of oxide – hydroxide aluminum phases were used.

It is known that nanoscale materials form poorly stable suspensions. [1] High ability to agglomerate the nanoparticles in an aqueous medium does not allow reaching the maximum surface and, consequently, the adsorption activity of the material. We used the ultrasonic dispergation for agglomerates to breaking up it.

Indeed, when ultrasonic dispergation of nanoparticles was used, sorption activity increased in several times (Table 1). So activation of nanopowders of iron oxide (Fe_3O_4) increases sorption capacity from 18 to 66%.

Table 1

Sorption characteristics of materials

Sorbent	Initial concentrations of uranium-ions, mcg/l	Without ultrasonic dispergation		With ultrasonic dispergation	
		Final concentrations of uranium-ions, mcg/l	Relative adsorption, %	Final concentrations of uranium-ions, mcg/l	Relative adsorption, %
Fe_3O_4	1 800	1 480	18	610	66
CuO	2 100	755	64	628	70
AlOOH	2 100	1 570	25	1 093	48

Best results have been obtained with powders of cupric oxide (CuO) as before ultrasonic dispergation, so and after (64 and 70% respectively). Nanoparticles of oxide – hydroxide aluminum phases (AlOOH) showed worse sorption