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LOST-CIRCULATION CONTROL WITH USING AERATED LIQUIDS

[1] Ziyadullayev O. E.,
[2] Egamberdiyev B. Sh,
[1] Iminjonov Z. Z.,
[2] Menglibekov A. B.,
[2] Komilov T. O.

[1]Uzbekistan, Tashkent, The Institute of chemical technology
[2]Uzbekistan, Tashkent, Tashkent state technical university

Abstract. *In article are given materials on lost-circulation control with using aerated drill fluids. Depending on type source of washing fluid were studied conditions of aerated liquid and reduce hydrostatic pressure to permeable zone.*

Keywords: *aerated washing liquid, hydrostatic pressures, absorbing, horizon, drilling fluid, penetration, layer, annular space, pole, pump.*

Main effect when using aerated washing liquids in fight with absorptions is reached in consequence of reduction hydrostatic pressures on permeable zone. But simultaneously air phase, evenly portioned on volume of the liquids in the manner of small bubbles, changes its structured-mechanical characteristic, intensifying some functions aerated liquids and as washing agent, and as agents of the fighting with absorptions. In analytically it is difficult so possibility of the efficient using aerated liquids value with the changing the pressure on consuming layer.

The aeration is subject to practically all washing liquids. This simplifies in choice of the type aerated washing liquids for different geological and technical conditions. As a rule, will aerated washing liquid, which used earlier. In that time in unstable sort transition on aerated washing liquid can cause the collapses of the borehole walls, if beforehand not to provide in correspondence with water loss of liquids to condition of drilling.

Aerated liquid reasonable to use for drilling or in condition, when there is possibility to pass the significant interval without undertaking the special insulating work, or if absorbing zone is opened at the depth, close to final, and conduct its insulation inadvisable. However, herewith necessary to take into account the depth of occurrence and power absorbing horizon, its permeability, value steady-state level, loss of the pressure in annular space, as well as technical possibilities of the reception of aerated liquids of the necessary specific gravity. The rough-and-ready estimate of the possibility of the using of aerated liquids usually produce with size relations of the depth steady-state level to depth of the zone of the absorption. The Critical limits of relations are defined by experience of the work and accepted technology of the reception of aerated liquids.

Hydrostatic pressure on bottom of the borehole, filled by aerated liquid, is defined or attitude mass or three – dimensional contents of the air to remaining portion aerated liquids, or specific gravities. Under greater contents of the air, when for aeration of the liquids use the compressor, use the notion «degree of the aeration», presenting itself attitude of the consumption of the air to consumption washing liquids.

Specific gravity aerated drilling fluid, under which will is reached balance between layer and hydrostatic pressure of the pole of aerated liquids, will is

$$\gamma_0 = \frac{\ln pi}{0.1\gamma fH + 1 + \ln pi - pi} \qquad (1)$$

The formula is received for condition of the steady-state balance in system layer-bore hole. In process of the circulations pressure pole aerated liquids on permeable layer will several more. On the other hand, in it's not taken rheological characteristics of washing liquid. These factors will act opposite. However, definitely installed that for mud solution formula (1) gives the unrated results that must be taken into account at decision of practicability of the using of aerated liquids in that or other condition.

Herewith follows to bear in mind that than more intensity of the absorption, that practical

specific gravity less differs from accounting, since in this case on the strength of opening channel passing of washing liquids structured-mechanical characteristic last influence upon nature of the absorption less.

When use aerated liquids pumps, working at solution, containing air, work worse. The technical possibilities drilling pump in many ways define the border of the minimum specific gravities applicable aerated liquids. The worsening of pump is conditioned presence in them space, verging to worker to volume cylinder. In process discharging of aerated liquid is compressed. The pump can porch the aerated liquid in that event only, when volume in pump at working pressure will more, than volume dead space. Supply to drill pump Q can be determined on found out by formula

$$Q = \frac{pd}{ps}\left[aV + (1+a)V - V'\right]ain \tag{2}$$

where, p_d— discharge pressure; p_s — suction pressure; a – contents of the gas in unit of the volume aerated liquids, %; V - internal capacity of the pump, occupied by liquid, dm^3; V' - capacity «dead» space, dm^3; α – factor drain, characterizing technical condition of the pump; i — number cylinder of the pump; n – number of work course of piston, 1/minutes.

Thence, if neglect specific gravities of the air, possible get minimum specific gravity γ_{min} of aerated liquids, which can zorch pump under given for conditions of the drilling to supplying:

$$\gamma_{\min} = \frac{\frac{p_d Q_{giv}}{ain} + pV' - p_s V}{(p_d - p_s)\text{y V}} \tag{3}$$

Depending on type source of washing liquids the aerated liquids are stable or non-stable system. In stable system air phase is saved long, and pumps in process of the drilling all time work at air containing liquids. The structured washing liquid gives the stable systems. Water and other Newton's washing liquids (silicate-gaming, saline) give unstable aerated liquids, which on output from bore hole are stratified on air and fluid phase. The pumps on such liquid work in happy circumstances. So, if allows the geological cut, choice of aerated liquids follows to show a preference to aerated water.

Aerated liquids are possible to use with filler. In this case better use the structured drill fluids. The effect of the action of the fillers in such solution above, than in thick, since occurs multifunction clogging channel of the absorption particle of the filler and bubbles of the air.

On the strength of compression of the air phase with depth specific gravity aerated drill fluid increases, and on greater depth the aerated drill fluid practically does not differ from source fluid. With depth part air opens in fluid phase, and useful volume of the air else more decreases. With reduction of the pressure air newly stands out in liquid in the manner of the most small evenly portioned on volume bubbles. So if absorption of washing liquids began in process of the drilling in upper interval of the well, that aerated liquid possible to use even when much of the air phase opens on bottom of the borehole.

Aerated liquids efficient when opening aquifer horizon in bore hole on water and on exploratory hydro geological borehole, since prevent or greatly reduce contamination productive horizon. Somewhat this is reached by regulation of the correlation by hydrostatic and layer pressures, but is somewhat conditioned by sharp reduction of the depth of the penetration aerated drill fluid in layer. Particularly they are efficient when opening high permeably horizon of the lowered pressure.

Very important at choice of aerated liquids as instruments of the warning the absorptions when drilling has observance of the requirement guard protection of environment. Particularly is actual aerated liquid under re-drilling absorbing horizon with qualitative underground water, which can be used as the source of the water-supply. Under re-drilling such zones can be absorbed big volume of washing liquids, containing different sort chemical reagents. Such horizons by means of aerated liquids possible re-drilling on galley proof equality hydrostatic and layer pressures and completely exclude or greatly reduce contamination.

Conclusion. Decision, making about practicability of the using aerated washing liquids in many way is conditioned by volume of available information about hydro geological region. The preliminary detailed study of hydro geological conditions of the work, allows to get the necessary sources material for primary estimation and avoid the unnecessary losses of the facilities and time.

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