Int. J. Chem. Sci.: 12(1), 2014, 253-259
ISSN 0972-768X
www.sadgurupublications.com

VIBROIMPULSNOE TECHNOLOGY DEVELOPMENT OF PRODUCTIVE LAYERS

B. T. RATOV*, B. V. FEDOROV and T. A. ZHANABAYEV

The Kazakh National Technical University after name of K. I. Satpayev, Satpaev Street,
050013 ALMATY 22, REPUBLIC OF KAZAKHSTAN

ABSTRACT

The paper presents the rationale and effectiveness of the use of declamation development of productive layers vibrating pulses that act through the liquid on the walls weirs dull producing formations. The calculation of the basic parameters of the transfer of shock pulses was made through the liquid waveguide. A description of the principle was developed in said device for the development of productive formations and the results of its industrial testing.

Key words: Vibratory impulses liquid waveguide parameter calculation, Development, Producing formation.

INTRODUCTION

The reservoir is built unstable, prone to caving, usually opened with mud. The latter is to create a dense, sufficient strength crust, which is provided under the protection of the filter installation. The call flow of fluids in this case is possible only after the filter cake (Fig. 1). There are numerous ways just claying and development of productive strata: for flushing filter space, airlift pumping, blast explosives, swabbing, etc. - In total, more than 20 ways.

EXPERIMENTAL

Among them, a special place is occupied by hydro vibration method, the essence of which is shown in ris. 1. Dlya excitation shock pulses in the liquid in the bottom-hole portion of the well, in the filter area on drill pipes lowered oscillator-hydraulic hammer. Last equipped with a spring-loaded anvil terminating disk, whose diameter is close to the inner

*Author for correspondence; E-mail: boranbairatov@yahoo.com

diameter of the filter. When the generator is on the anvil, it causes the striker at a certain frequency periodic shocks transmitted through the drive fluid, in which the formed pressure wave moving towards the sump filter plug. Being reflected, compression wave transformed into backward waves stretching. It is known that the strength of the liquid with a small deformation. Therefore, gaps formed in the liquid, which is then slammed shut by the action of a large pressure drop. As a result, alternating pressure filter cake on the filter and reservoir collapses and subsequent pumping products declamation brings to the surface. Numerous studies hydro development vibrating layers indicate that a reliable time argillization borehole occurs at a pressure drop of at least 0.4 MPa (4 bar).[1-3]

In order to prove the effectiveness of hydraulic vibration times claying oil reservoirs carry calculation of the basic parameters of the process.[1] Initial data for calculation:

Outer diameter filter frame – 168 mm;

Internal – 150 mm;

Hydraulic hammer – G7.

The later has the following characteristics: Water consumption – 100-200 l/min, the pressure drop in the car – 1.5-3.0 MPa (15-30 atm) and the mass of the hammer hydraulic hammer M – 11 Kg, single impact energy – 70 J; beats per minute – 1,200 beats/min, diameter – 70 mm, weight anvil drive – 10 Kg, length – 2000 mm, weight drummer – 50 Kg.

The sequence of calculation is as follows[1]:

(i) Determined by the speed of the anvil V_0 with the disk, when hitting the hammer

$$V_0 = \sqrt{\frac{2\eta A}{m_0}} \qquad \ldots(1)$$

Where η-kpd the efficiency of energy transfer from the hammer hydraulic hammer anvil from the disc; $\eta = 0.75 \div 0.8$.[1]

A = Hydraulic hammer blow energy; A = 70 J;

m_0 = Mass of the anvil with the disk; m_0 = 10 Kg.

(ii) Equivalence is yielding spring working body and fluid occupying part of the well bottom hole, which are, respectively, yielding $\delta_{пр}$ и $\delta_{ж}$

$$\delta_{э} = \frac{\delta_{пр}\delta_{ж}}{\delta_{пр} + \delta_{ж}} \quad \ldots(2)$$

(iii) Determine the length of the liquid waveguide (the liquid in the sump and filter range) at, which the strike ends in the first phase; ($0 < t < \frac{2l}{a_{ж}}$; where t – time, l – length of the liquid and $\alpha_{ж}$ – the speed waveguide of sound in the liquid):

$$L_1 = \frac{a_{ж}\pi}{2\sqrt{\frac{1}{\delta_{э}(M+m_0)} - \frac{a_{ж}^2}{4\delta_{э}^2(EF)^2}}} \quad \ldots(3)$$

where E – Modulus of elasticity; E = 2 x 10^9 Pa fluid;

$F = \frac{\pi}{4}d_{ж}^2$ - The area of the end face of the liquid column, which affects disk anvil (Fig. 1); $d_{ж}$ - The diameter of the end face; and you can take $d_{ж} \approx D = 150mm = 0{,}15m$; (*D*-internal diameter filter); $F = \frac{\pi}{4}(0.15)^2 = 17.7 \cdot 10^{-3} м^2$

M – Mass of the impact; M = 11 Kg.

(iv) Determine the maximum impact force on liquid – waveguide in the first stage:

$$P_{H\max} = \frac{V_0}{n\delta_{э}}\exp\left[-\frac{m}{n}arctg(\frac{m}{n})\right]\sin[arctg(\frac{m}{n})] \quad \ldots(4)$$

where $$n = \sqrt{\frac{1}{\delta_{э}(M+m_0)} - \frac{a_{ж}^2}{4\delta_{э}^2\ (EF)^2}}\ ;$$

$$m = \frac{a_{ж}}{2\delta_{э}EF}\ .$$

(v) Determined by the strike drive anvil on a columb of liquid (liquid waveguide)

$$t_y = 2L_1 / a_{ж}, sek \quad \ldots(5)$$

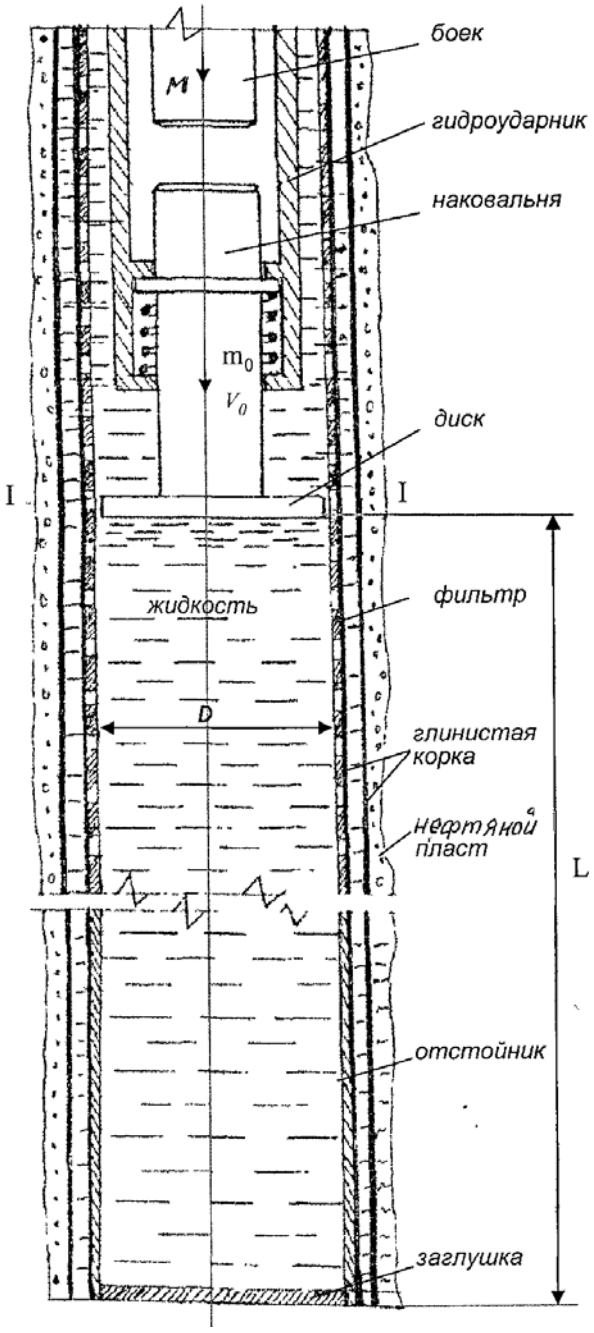

Fig. 1: Hydro scheme vibration mode of development of productive reservoir

(0) Liquid, (1) Peen, (2) Hydraulic, (3) Hammer, (4) Disk, (5) Filter, (6) Glinistoya crust, (7) Oil reservoir, (8) Sump, (9) Cap)

(vi) Determined by frequency of attacks drive anvil for liquid-waveguide:

$$f = \frac{1}{tg} Гц \quad \ldots(6)$$

(vii) Determine the maximum pressure in the pulse moving through liquid-waveguide

$$P_{\max} = P_{H\max} / F \quad \ldots(7)$$

By formulas (1-7), were calculated process parameters of the interventions or liquid waveguide with these initial data. These parameters are as follows:

V_0 = 3, 85 m/s; $\delta_э = 4 \cdot 10^{-6} m/n$; L_1 =17 m P_{hmax} = 7733H; t_y = 0, 0283 sek; $f = 35{,}3 Гцl 2120 уд/\min$; P_{max} = 0, 437МПа (4, 37 atm).

Thus, the design pressure pulses and their frequency will ensure the effective time claying and mastering the reservoir. At the same time as the drive working body (anvil disk) used the most powerful hydraulic hammer G7 and frame filter as the most widely used pipe 168/150.

For experimental verification of high efficiency, vibrating hydro development wells have been constructed device, originality of design is patented RK.[1]

Device (Fig. 2) consists of hammers G59V having 7 dzh impact energy and the attached hydro working body vibration. Last pre-constitutes tube 11, which are dressed with a clearance sleeve 9, separated by discs 8. In the pipe sleeves and provided with radial holes for discharging the spent water in the hammers. To exclude uncontrolled leakage of fluid between the discs and pads fitted sleeves, and on the lower end of the tube 11 is threaded nut for olive with ¬ 12. Verhny end of the pipe and passed through the flange mates with a threaded stop nut 2, which in turn is connected to the anvil by splines with the adapter 1. Between the ends of the thrust flange nuts 2 and posted 14 springs 4.

Operation is as follows. When the working fluid (water) in the piston hammers drill pipe begins to strike the anvil. Last at each stroke of the piston through a splined connection with adapter 1 moves down, squeezing through the thrust bearing 2 springs 4 and moves in the same direction tube 11 discs. The latter, in turn, transmit the impact pulses in the surrounding fluid. Shock pulses occurring between adjacent discs repeatedly reflected from the latter exert a force on the weirs frosted filter, and when cleaning it - dull weirs on the

borehole wall. Power pulse that occurs when you hit the fluid clamping nut 12 moves to plug the sump filter. Reflected in the form of waves stretching pulse returns to the nut 12. Arising from these cavitations phenomena also contribute to cleaning the air filter and declamation borehole walls.[4]

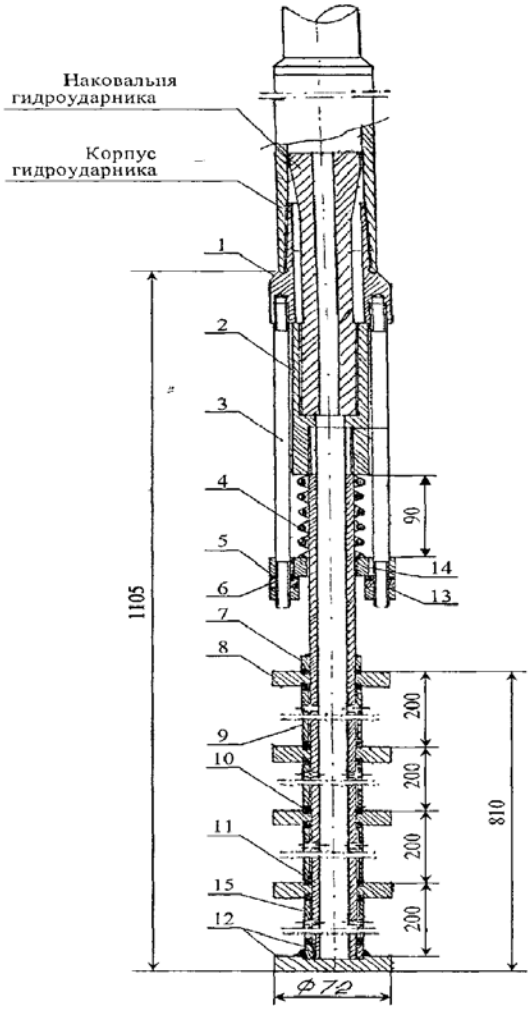

Fig. 2: Device for hydro vibration times claying productive formations (1) Nokovalnaya hydraulic hammer, (2) Housing hydraulic hammer

When the hammer-stroke of the piston hydraulic hammer under the recoil spring up waste water in the central channel and anvil of hard nut falls into the pipe 11 and through the radial holes in it and in sleeves 9, chosen scribed out, providing additional cleansing effect on the filter.

With a stroke of the piston-striker hammers under the action of the return spring up waste water through the central channel of the anvil and hard nut enters the tube 11 and through the radial holes in it and in the bushes 9, thrown out, providing additional cleansing effect on the filter. Machine was tested at times claying productive formations in geotechnical boreholes constructed for uranium mining, and showed high efficiency. Time of hydro vibration claying time decreased by 4 times compared to air lift pumping (6 hours compared with 24 hrs) with a significant economic effect.

CONCLUSION

Practice using vibrating development of reservoirs in small diameter wells showed high efficiency to the real possibility of using the oil wells of large diameter. The calculation show that as the drive for the development of oil reservoirs vibrating use shock pulse generator having an impact energy of at least 70-80 Joules. In this hydraulic hammer is the G-7, is commercially available in Russia. The above calculations show that this provides a hydraulic hammer in the liquid filling, the hole diameter of 150, 160 mm pressure drop of more than 0.4 MPa (4 bar), which provides an effective declamation the reservoir.

REFERENCES

1. V. A. Romanenko and E. Volnitskaya, Mrecoveryper form Ance-Water Wells, Moscow, Nedra (1986).
2. N. I. Serdyuk, Cavitation Ways Dekolmatatsii Boreholes, M. of VNIIOENT (2004).
3. S. K. Kudaykulov, A. Kasenov, B. T. Ratov and B. V. Fedorov, Device for Vibration Razglinizatsii Aquifers, A Provisional Patent 14693 Republic of Kazakhstan (2003).
4. B. T. Ratov and B. V. Fedorov, Hydroimpulsive Development of Fluid-Containing Recovery, Life Sci. J., **10(11s)**, 302-305 (2013).

Accepted : 08.12.2013