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Perspectives Using the Screw bar Pump

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ABSTRACT: Today, the productivity of oil wells directly depends on the development of oil and gas fields. The amount of oil withdrawn from an oil and gas field is limited by a significant reduction in the flow rates of oil wells, and especially those at the late stages of development. To get involved in the selection of hydrocarbons, it is necessary to study the geological and technical indicators of the field and introduce new technologies in the production of hydrocarbons. Take this for the Mathonat field, we propose the use of a screw rod pump

KEY WORDS: field, oil , flow rate , wells , reservoir , screw, pump, viscosity,

I. INTRODUCTION

Administratively, the Matonat field is located in the Alat district of the Bukhara region of the Republic of Uzbekistan, south of the Divalkak gas condensate field [3] .

Orohydrographically, the study area is located in the lower reaches of the Zaravshan River, it is represented by a slightly undulating semi-desert relief, the absolute elevations of which fluctuate, from west to east, from +220 m to +245 m above sea level. On the upland parts, the surface of the relief is covered with weakly fixed sands, sandy loams, rubble, in the lower areas, salt marshes and takyrs. The landscape is expressed by solitary dunes and sandy ridges of insignificant size.

The study area belongs to the category of waterless semi-deserts, there are no natural surface watercourses within its boundaries. Large waterways flowing near the field are the Amu-Bukhara irrigation canal (10 km to the north-west) and the Amu-Darya river (70 km to the south-west). Since, due to the strong swampiness of the area, the approaches to the Amu-Bukhara irrigation canal are not closer than 500 m, and the Amu-Darya river is separated by mobile sand ridges, water is provided for drinking, household needs and the cooling system of the internal combustion engine during exploration works on the territory of the field were carried out from the city of Alat.

II. MAIN PART

A. COMPOSITION AND PROPERTIES OF RESERVOIR OIL

At the considered field, when testing the perforation interval of 2194-2191 m of well No. 5, the following inflows were obtained:

- oil with a flow rate of 69.12 m3 / day and gas with a flow rate of 78956 m3 / day when the well is operated with an 8 mm choke;
- oil with a flow rate of 38.88 m3 / day and gas with a flow rate of 51746 m3 / day when the well is operating on a 6 mm choke [3] .

It was not possible to take deep samples of reservoir oil from this sampling interval for technical reasons. In this regard, in the process of separation of the gas-liquid mixture, surface samples of the separated oil (in containers) and gas (in cylinders and bottles) were taken for laboratory research. Separation of the oil and gas condensate mixture

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was carried out using a mobile separation unit STsV-5 in two modes of well operation and two modes of separation. Conditions under which the samples were taken:

48 D_{pcs} = 8 mm
P_{head} = 10.30 MPa
P_{zat} = 11.87 MPa
P_{sep} = 6 MPa
T_{sep} = 41 ° C
Q_{gas} = 78.956 × 103 m^3 / day
Q of $_{oil}$ = 69.12 m^3 / day
Q_{water} = 1.43 cm^3 / day

D_{pcs} = 6 mm
P_{head} = 10.53 MPa
R_{zatr} = 12.81 MPa
$R_{sep.}$ = 6 MPa
$t_{sep.}$ = 36 ° C
Q_{gas} = 51.746 × 103 m^3 / day
Q_{oil} = 38.88 m^3 / day

In order to obtain the main characteristics of reservoir oil under laboratory conditions, an experiment was carried out on a phase equilibrium set-up by the Alstom-Atlantik company. The essence of the experiment is that samples of separated (stable) oil and gas mixture separation under reservoir conditions were recombined in the PVT cell. The composed mixture of oil and gas was brought to reservoir conditions (Pm. = 21.32 MPa and tm. = 95 ° C). The combined sample from gas and separated oil was compiled in accordance with the obtained value of the field gas factor. Under these reservoir conditions and ratios, part of the gas during the experiment did not dissolve in oil, which indicates an overestimated value of the obtained gas factor. In all likelihood, when testing the studied interval, there was an insignificant entrainment of gas and condensate from the gas-saturated part of the reservoir, the quantitative ratio of which cannot be determined unambiguously. This fact is also confirmed by the geological study of the field, so the gas-oil contact is taken at an elevation of -1954 m, and the absolute elevation of the studied object is minus 1954 - 1951 m, it follows that three meters of the investigated interval is located in the gas-bearing part of the deposit.

Table 1. - Physical and chemical characteristics of oil from the Matonat field, well No. 5, interval 2194 - 2197

m

Indicator name	Value
1 Water content,%:	18
2 Density (p420, g / cm3) at 20 ° C	0.8799
3 Kinematic viscosity at 20 ° C, c Stokes	17.52
4 Content of asphalt,%	1.23
5 Resin content,%	15.03
6 Paraffin content,%	6,3
7 Molecular weight	230
8 Content of chloride salts, mg / 1	438.45
9 Fractional composition:	
the beginning of boiling, ° C	62
5% distilled at temperature, ° C	98
10% the same	164
fifteen %	211
20 %	233
25%	261
thirty %	284
35%	303
40%	318
45%	327
50 %	349
End of boiling, ° C	350
Balance - 48%, Loss - 2%	

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Table 2. - Component composition of separation gas, oil-condensate mixture of well No. 5 of the Matonat field, horizon XV-P, interval 2194 - 2191 m

Indicator name	Value
1. Molar fraction of the component,%	
CH_4	88.76
C_2H_6	5.27
C_3H_8	1.71
iso - C_4H_{10}	0.33
n-C_4H_{10}	0.59
C_5H_{12}	0.15
H-C_5H_{12}	0.13
C_6H_4	0.13
C_7H_{16} + в	0.07
N_2	0.95
CO_2	1.52
H_2S	0.39
total	100
2. Relative molecular weight of gas	18.65
3. The density of the gas at 20 ° C and 760 mm Hg. Art.	0.7758

As a result of the experiment to determine the saturation pressure and one-time degassing of oil [3] on the phase equilibrium unit of the company "Alstom-Atlantik", the main parameters of reservoir oil were obtained for the interval 2194 - 2191 m of well No. 5 of the Matonat field:
- saturation pressure at reservoir temperature, MPa -20.2;
- gas content:
  m^3 / m^3 - 167.8;
  m^3 / t - 190.7:
- volumetric coefficient - 1.5;
- shrinkage,% - 33.3;
- oil density, kg / m3:
  reservoir - 673.4;
  stable - 879.9
- relative molecular weight - 230.

III. METHODOLOGY

A. OPERATION OF WELLS WITH SCREW BODY PUMPS

The disadvantages of sucker rod pumping units and ESP units are the complexity of maintenance, instability in operation during the production of liquids with a high content of solids and gas, as well as a low degree of reliability when operating cluster wells [5] .

In order to eliminate the noted disadvantages, as well as to solve the problem of pumping out a liquid of increased viscosity, screw pump installations were proposed, which have a number of advantages over other types of pumps. In comparison with ESP, during the operation of the UHP there is very little mixing of the pumped liquid, which prevents the formation of stable emulsions from oil and water. The absence of valves and complex passages makes the design simpler and reduces hydraulic losses. The pumps have increased reliability (especially when pumping liquids with mechanical impurities) due to the fact that they have a minimum number of moving parts, are easy to

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manufacture and operate, and are more economical. When pumping a liquid of increased viscosity, the overflows through the sealing contact line between the screw and the cage are reduced, which improves the pump performance.

Table 3. Technical characteristics of UVN of a number of manufacturers

Basic parameters of ESP 5, produced by Special Design Bureau of Rodless Pumps (Moscow)

Parameter	Standard size					
	UEVN5-16-1200	UEVN5-25-1000	UEVN5-63-1200	UEVN5-100-1000	UEVN5-100-1200	UEVN5-200-900
Nominal flow rate, m^3 / day	16	25	63	100	100	200
Nominal pressure, MPa	12	10	12	10	12	9
Electric motor power *, kW	5.5	5.5 (22)	22	22 (32)	32	32
Submersible unit weight, kg	341	342	546	556	697	713
* Electric motor of PED type with water protection 1G51						

Due to their insensitivity to free gas, PC pumps are ideal for pumping highly carbonated oils. They are more wear-resistant in the production of oil containing mechanical impurities, since solid particles passing through the pump are pressed into the elastomer of the cage (stator), which is deformed but does not evaporate.

B. CONSTRUCTION OF THE SCREW ROD PUMP

The screw rod pump includes units, the purpose and design of which are as follows.

The gas separator (Fig. 1) provides a partial separation of gas from the liquid entering the pump by changing the direction of its movement into the intake. It consists of a pipe system equipped with inlet and outlet channels (Fig. 2). The anchor (in the specification of the company - a torsion anchor) ensures reliable fixation of the pump in the casing and thereby prevents arbitrary rotation of the tubing during the pump operation [5]

The screw pump consists of a stator 3 and a rotor (screw) 4 (see Fig. 1). The stator is a metal tube into which it is pressed - elastomer material resistant to mechanical impurities, oil and corrosive liquids. However, carbon dioxide and free carbon dioxide cause destruction of the elastomer; therefore, a limitation is imposed on the content of these components in the produced fluid, the amount of which should not exceed 1000 mg / l.

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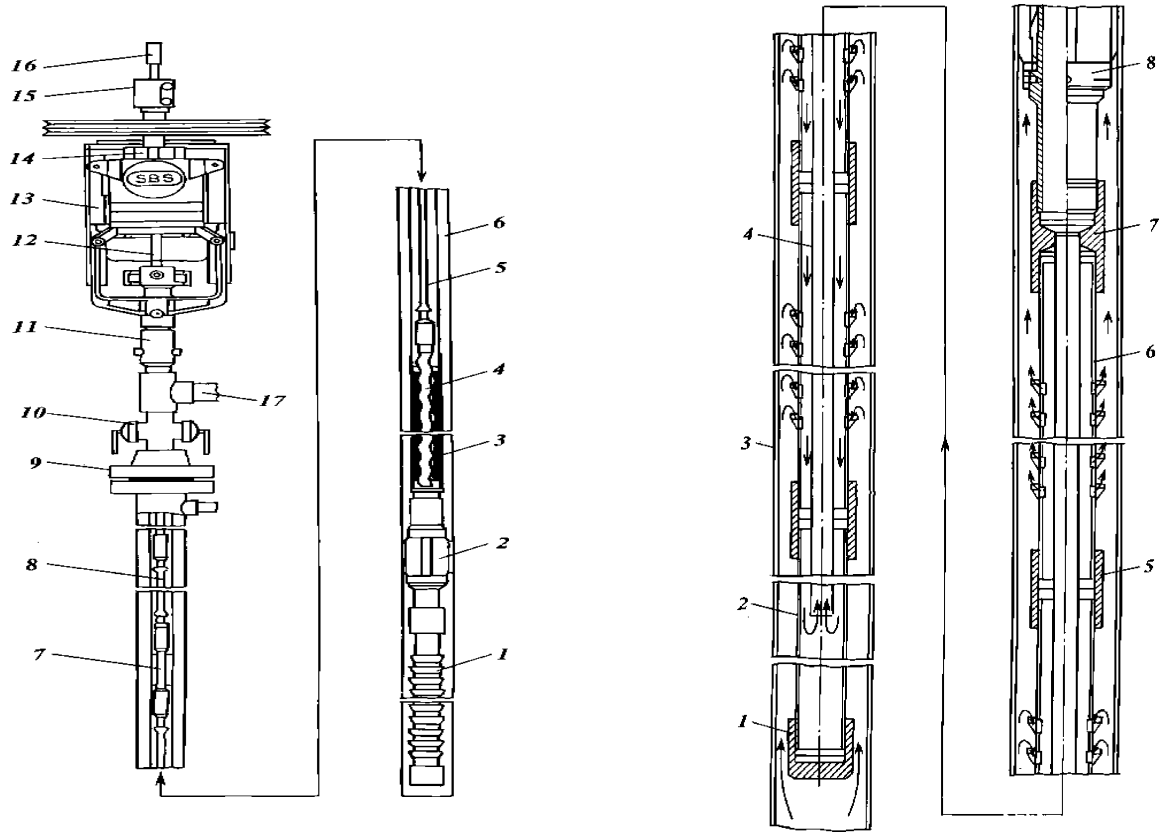

Fig. 1. ESP with surface drive from "Scheller-Blekman": 1-gas anchor; 2-dynamic anchor; 3-stator; 4-rotor; 5-pump rods; 6-tubing; 7-non-rotating protector; 8-shortened rods; 9-drive head adapter; 10-single ram BOP; 11-second oil seal; 12-polished stock; 13-explosion-proof engine; 14-drive

Fig. 2 : Gas separator of the screw submersible pump of the cup-type firm "Scheller-Blekman": 1-plug; 2-tubing; 3-casing pipe; 4-suction pipe; 5-clutch; 6-gas anchor; 7-way clutch; 8 mechanical anchor.head; 15- polished rod clamp; 16- clutch; 17-armature

IV. CONCLUSION

Today, the use of various structurally and technologically modified pumps to increase oil production is a requirement of the time. Thus, the application of the necessary and suitable production technology at the final stage of field development is economically and technologically efficient. From this we can conclude that the use of screw pumps in the wells of the Matonat field corresponds to the amount of fluid production from well No. 5, the productivity of the screw pump is in Table 3 UEVN5-63-1200

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