GROUND EQUIPMENT FOR COLLECTING ANNULAR GAS IN WELLS

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Summary: There are a lot of wells with free gas in the content of product got from the layer among the rod borehole pump installations of "Azneft" PU. But according to some reasons, the necessary communications in the mines either are in the unsuitable conditions, or do not exist. That is why the backside of most wells operates in an open state that causes the environmental pollution and loss of valuable products. In order to prevent this, the pipe front space is often shut hermetically. However, this process is possible when the gas production is less (up to 10 $м^3/day$) , the extension causes the distortion of operating mode of the well.

I reorder to liquidate the above mentioned shortcomings, the ground equipment has been developed. This equipment creates ad favorable operating mode in the well and at the same time prevents the loss of pipe front gas. This, it regulates the pipe front gas and provides the transmission of this gas to the discharge line and its transportation with production well.

After the trimmed equipment was set in the 3304th well of "Bibiheybatneft" oil and Gas Production, it became possible not only to let gas into the air, but also to increase the oil production, and to decrease the number of underground constructions.

Keywords: well, bar, pump, valve, inverted valve, output.

AMS Subject Classification: 74PIO

1. Introduction. The environment of the wells operated with the use of sucker rod pumps (SRP), there are many wells in which free gas occupies a significant place in the composition of the produced products. Collected and systematized information about these wells. At the same time, wells in the production of which the gas factor exceeds 10m3 / day are not taken into account.

The unsuitability of gas and vacuum lines for collecting annular gas and the openness of the annular space in many wells lead to gas losses and environmental pollution. In this regard, in some cases, the annular space is sealed.

Thus, when operating a well with a gas flow rate of less than 10 m3 / day. to prevent loss of annular gas, it is possible to overlap the annular space. But when the consumption of free gas is more than 10m3 / day. this leads to a violation of the operating mode.

Analysis of production data shows that a certain part of the annular gas is directed to gas and vacuum pipelines, the rest (a significant part) is released into the open atmosphere.

During well operation, free gas accumulates in the annulus and still enters the pump cylinder. The gas accumulated in the annular space is produced by one of the indicated methods, and the gas entering the pump together with the liquid is produced by the tubing. Depending on the conditions, in both cases, the harmful effect of gas worsens the technical and economic indicators of operation (the filling factor of the pump decreases, the flow of sand forms a sand plug, reduces the overhaul period, etc.).

In the practice of oil and gas production, the negative effects of free gas on pump performance and methods of combating this phenomenon are known [1]. However, the lack of a comprehensive solution to this problem today, the task of improving the methods of combating the harmful effect of annular sand and gas on the pump operation remains relevant.

The release of gas from the liquid inside the well and in the installation system of a sucker rod - with the open state of the suction pump;

- With the open state of the suction pump;
- In the presence of a gas separator at the intake of sucker rod pumps;
- When installing a special valve in the tubing;
- Connection of the annular space with a vacuum or gas line for transportation of the collected in the annular space;
- Extraction of gas from the annular space and its direction into the flow line of the well using an overhead compressor.

An open sucker rod pump intake state is considered the worst case of a well operation. In this case, the released gas reduces the pump efficiency, and in some cases stops it altogether. On the other hand, the release of gas from the liquid around the bottom of the well leads to the destruction of the poorly cemented reservoir and, as a result, contributes to the flow into the wells of a significant amount of sand in the composition of the liquid [2]. And this negatively affects the well operation process.

Separators of sand and gas are used separately depending on the amount of sand and free gas in the wells with downhole pumps. Of these, sand and gas separators are most commonly used for tubular pumps, while gas separators such as a two-stage gas separator are mainly used for other pumps. However, this approach to solving the problem is considered incorrect. It is enough to use only a gas separator in the well with an insignificant amount of sand in the produced fluid due to the absence of the harmful effect of sand. On the contrary, the high content of sand and insignificant gas evolution does not justify the use of only sand separators, since the entry of even a small amount of gas into the pump cylinder reduces its filling factor. The impossibility of

regulating the operation of gas and sand separators by fractions of the composition of sand is their most significant drawback at the present time.

Analysis of the field data shows that these measures do not allow solving all the problems of the influence of gas and sand on the operation of the pumping unit. The released gas accumulating in the annulus creates other problems as well. When the pressure in the annular space rises, the check valves installed in the tubing, opening, facilitates the flow of gas into the tubing, having a positive effect on the fluid rise. However, in some cases, an increase in the pressure in the annulus worsens the flow of fluid into the bottom of the well and creates various difficulties in the operation of the valve.

As noted above, in such cases, the annular gas is either released into the atmosphere or the annular space is hermetically sealed. In the first case, gas is lost as a valuable raw material and the atmosphere is polluted. And in the second case, gas accumulating in the annulus leads to an increase in pressure and a decrease in the dynamic level, which contributes to a complete disruption of the pump. In such cases, the known one-pipe method of operation should be applied to produce annular gas.

The essence of this method lies in the fact that annular gas is supplied to the flow line using various equipment. But this method also has certain disadvantages. The fact is that in-line gas pipelines are usually used to supply annular gas to the flow line. However, the need to fix this device to the rods closer to the wellhead creates certain problems, since in this case all the rods hang from this device and it is exposed to a large load, this complicates the landing of the deep pump, it becomes impossible to check the pump operation after repair in the well, and tightness of tubing (filling pipes with water). To eliminate these shortcomings, various possible ways of solving the problem were analyzed and new ground equipment was developed and manufactured. The figure below shows a schematic diagram of the surface annular gas production equipment (OCGP) and how it is secured.

The surface equipment consists of two parts: a gas trap connected by the annular space and a gas-liquid mixture conductor installed on the flow line of the well.

Installation of ground equipment is carried out in the following sequence. The body of the gas trap is connected to the fitting that tightly covers the annular space. To adjust the gas extraction from the annular space, special washers are used. The washer is installed between the union and the seal. Next, a gas hose, a pressure gauge and a fitting are attached to the body. The body of the gas-liquid mixture conductor is connected to the wellhead seal. Next, a gas pipe, a cover, a check valve and an elbow are connected to the body. The elbow connects to the flowline of the well. To send annular gas into the flow line, a hose is connected to a check valve and a

permanent magnet is mounted on the well stem. Ground equipment, assembled in this sequence, begins to operate from the moment the well is put into operation.

The advantage of this system is that gas losses are prevented and it becomes possible to regulate formation gas production for a well by using special-sized chokes.

This surface equipment was installed at well No. 3304 of Bibikheybetneft NGDU. The well has the following geological and technical characteristics: horizon, well bottom -379m, filter - 374-252m, tubing: 75mm-11 pieces and 60mm-28 pieces, rods 19mm-41 pieces, pump range-175 TLM (BGN-2-44mm), suspension depth - 355 m, stroke length - 0.45 m, number of oscillations - 10 rpm, theoretical pump productivity - 9.85 m / day, recovery factor - 0.3, daily oil production rate - 1.0 t, water - 2, 0t and gas -200m (note that this volume of gas, due to the absence of a vacuum line, was released into the atmosphere).

The installation is mounted by connecting the inlet part with the annular space, and the outlet part with the flow line of the well. The annular gas passing through the choke with the help of the gas-conducting rod enters the flow line. To prevent the backflow of liquid and gas, check valves are installed at the inlet and outlet. Pressure gauges at the inlet and outlet of the choke allow you to monitor the pressure in the annulus and in the flow line.

Entering the flow line from the annular space, gas mixing with the well product facilitates its movement in the pipeline to the collection point.

Thus, the use of this installation for preventing environmental pollution, at the same time directs its energy to facilitate the process of transportation of well products.

A special choke provided in the installation allows creating the most advantageous operating mode in the well by adjusting the flow of annular gas. In addition, excessive production of formation gas is prevented by selecting an advantageous well operation mode. This installation was first applied without a union. The measured parameters are as follows: annular pressure - 0.09 MPa, flow rate of oil, water -, gas -. Given the large volume of annular gas, a mm choke was used. After that, the above parameters had the following meanings:

Thus, the use of this unit has led to an increase in oil recovery of the well, a reduction in the number of required workovers and an increase in the turnaround time.

The results obtained on the example of well # 3304 create ample opportunities for using this unit in other fields as well. Analysis of the well stock of the Azneft Production Association operated with the use of deep pumps shows that there is a great need for the use of such installations in most of the wells. For such wells, by regulating the volume of annular gas, the most advantageous operating mode is created. For this purpose, for the installation of fittings and their replacement, it is envisaged to create a special unit. It should be noted that vacuum lines and

compressor stations are required to extract annular gas. But for certain reasons, these equipment are either absent altogether, or they are unusable.

The developed installation allows the solution of the noted problem by directing the annular gas into the flow line of the well.

Sentence.

1. PA "Azneft" has a large number of sucker-rod pumping wells, the products of which contain free gas. Separating at the bottom hole and at the pump intake, this gas through the annulus must be taken through the vacuum lines. However, in the fields, the communications required for this are absent or are in an emergency condition. In this regard, a large number of wells operate with an open annulus, which leads to environmental pollution and loss of production. To avoid this, the wellbore annulus is often hermetically sealed. However, such an action can be allowed only at low gas flow rates (10 m ^ 3 / day), and at higher rates, this contributes to serious disruptions in the well operation.

2. Having analyzed the many existing methods and techniques to prevent the above disadvantages,

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Наземные оборудование для сбора затрубного газа в скважинах

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Резюме: В ПО «Азнефть» имеется большое число штангонасосных скважин, в продукции которых содержится свободный газ. Отделяясь на забое и у приема насоса, этот газ через затрубное должен отбираться посредством вакуумных линий. Однако на промыслах необходимые для этого коммуникации отсутствуют или находятся в аварийном состоянии. В связи с этом большое число скважин работает при открытом затрубном пространстве, что приводит загрязнению окружающей среды и потерям продукции. Во избежание этого часто затрубное пространство скважины герметично перекрывают. Однако подобное действие можно допустить только при небольших дебитах газа (10 $м^3$/сут), а при более высоких это способствует серьезным нарушениям в работе скважины.

Проанализировав множество существующих способов и приемов по предотвращению перечисленных выше недостатков, сотрудниками лаборатории было разработано и изготовлено устройство, позволяющие одновременно установить благоприятный режим работы скважины и предотвратить потери затрубного газа. Первое обеспечивается путем регулирования отбора затрубного газа, второе – сбором его и направлением в выкидную линию скважины для дальнейшей транспортировки.

После установки устройства в скважины 3304 НГДУ «Бибиэйбатнефть» выброса газа в атмосферу, было достигнуто увеличение дебита нефти и сокращение числа подземных ремонтов.

Ключевые слова: скважина, штангонасосный способ, клапан, затрубный газ, добыча.

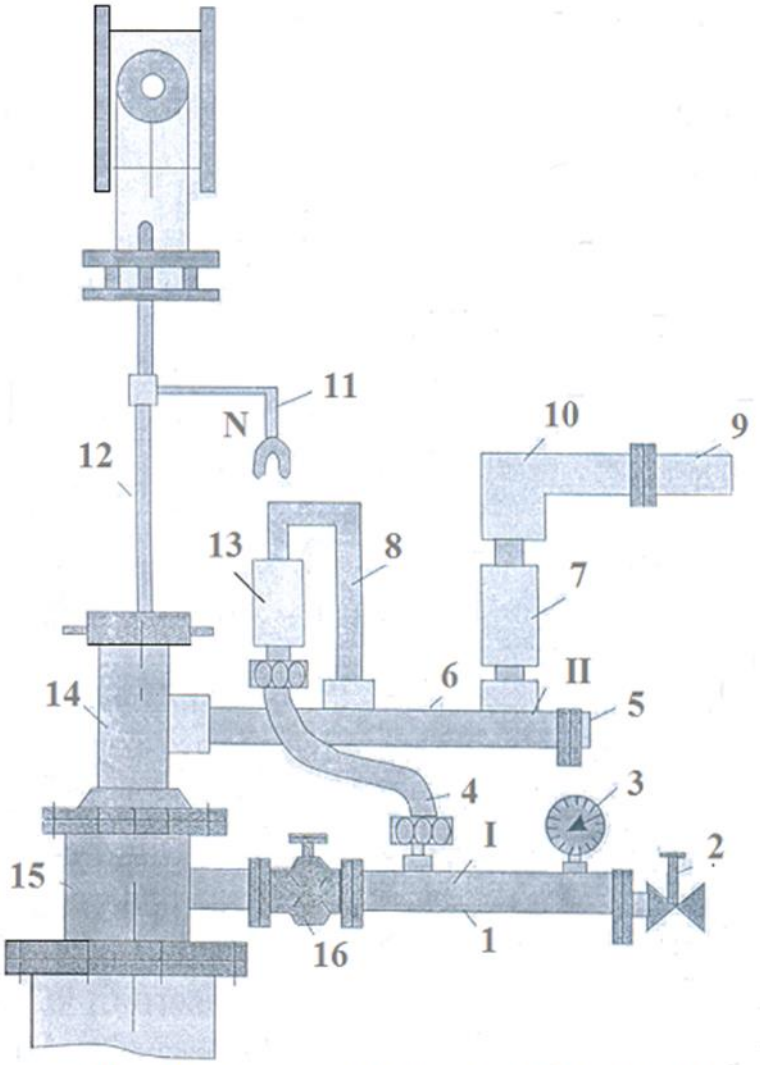

Рис. Схема монтажа наземного оборудования

I, II -ловушка и проводник соответственно; 1, 6 –корпус; 2-штанг или трубочка; 3 – манометр; 4 -– штанговая труба; 5 – крышка; 7, 13 – обратный клапан; 8 – “L” образная газопроводная труба; 9 - выкидная линия скважины; 10- колено; 11 –постоянный магнит; 12 – шток; 14-самовар; 15-головка; 16- штуцер