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ANALYSIS OF SELECTION THE OPTIMAL SEPARATION TECHNIQUES OIL FOR ASSOCIATED GAS UTILIZATION PROCESS

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ABSTRACT

The processes preparation of oil it is dehydration, desalination, as well as the stabilization of oil. Essence oil stabilization is separated from its volatile hydrocarbons (propane, butane fraction) and the soluble attendant gases in the oil, which reduces the loss of oil from the fumes, it reduces the intensity of corrosion of the process equipment, the equipment and piping along the path of movement of oil from the field to the refinery and also produces a valuable raw material for the petrochemical industry. In the vacuum separation of the oil is separated wide gas fraction, which along with propane-butane fraction contains large amounts of higher hydrocarbons, the extraction of oil which improves the quality of associated petroleum gas. Therefore, in terms of profitability, ease of maintenance and availability on the field gas treatment or associated petroleum gas treatment advisable in many cases to use a vacuum separation for oil stabilization.

Keywords: associated petroleum gas, booster pumping stations, oil treatment plants, liquefied petroleum gas, propane-butane, vacuum process.

INTRODUCTION

The process of gassing reservoir oil, i.e. separating associated gas, could begin in the tubing of oil wells. As the movement of production from wells on oil and gas pipelines also results in the release gas. Thus, the flow of produced oil passes from one phase state to two-phase - gassing oil and associated petroleum gas. This occurs as a result of pressure drop and temperature change of the reservoir fluid. The volume of gas released oil from the reservoir increases.

However, joint possession or transportation of oil and associated gas is not economically feasible. As a rule, the volume of gas produced is several times the amount of liquid. It would take a huge sealed containers and pipes of large diameter. Therefore, production facilities and training of oil and gas stream is divided into two - the oil and gas. Dividing the flow takes place in special apparatus - separators, in which conditions are created for a more complete separation of associated gas from oil. Oil degassing under certain controlled pressure and temperature is called separation.

Each oil field is the oil coming from wells that are undergoing preliminary training at the booster pumping stations (BPS), or the oil treatment plants (OTP). Further, it is transported to the central points of the preparation and pumping of oil (CPF). The fact that the oil contains associated gas and water, which must be learned in order to improve its commercial quality. At the moment, associated gas is extracted from the oil by separation in one or several stages (steps).

To extract APG use a different cage types (basically horizontal cylindrical). On the objects of oil preparation and gas separation of oil, usually carried out in several stages (steps). The degree of separation is called the separation of gas from oil at a certain pressure and temperature. Multistage separation allows obtaining more stable oil than the single stage. The number of stages of separation depends on the physico-chemical properties of extracted oil, reservoir pressure, water cut, and temperature of the fluid, as well as the requirements for commercial oil.

The effectiveness of multi-stage separation is especially pronounced for fields of light oil with high gas factor and the gas pressures at the heads of wells. Adjustable pressure and temperature create conditions for a more complete separation of gas from oil. Pressure on the separator 1st stage is always greater than the separators 2 and subsequent steps. The pressure at the stages of separation depends on many factors that are taken into account in the design field and are included in the technological scheme. The number of cages depends on the volume of extracted oil.

However, if multistage separation will be used in unpressurized systems collect and transport light hydrocarbons left in the oil will gradually evaporate from it, and the effect of separation will be reduced to zero. When multistage separation gas first stages can move to the consumer under it is own pressure. While in petroleum gas decreases the content of heavy components (C_5), which reduces the chance of condensation during transport. Because the C_4 hydrocarbons and C_3 partially remain in the oil, it decreases the amount of gas separated from oil.

Therefore, from the point of view of profitability, ease of maintenance and availability of near field associated petroleum gas treatment (APGT) it is advisable in all cases to apply the three-step separation. Released on the first stage of separation of the gas under its own pressure is directed to local needs in boilers for heating residential and industrial buildings, etc. the gas is received at the second and third stages of separation, will be bold, so he first goes to APGT for the preparation of the dry fuel gas to obtain liquefied petroleum gas (LPG).

The fact that when carrying out the separation under optimal conditions of oil could be obtained by 3-5% more, not always taken into account at the fields. Selection of optimal conditions separation is determined by the order based on two main criteria:

a) the maximum possible oil yield from per unit volume of the mixture;

b) the maximum content of heavy hydrocarbons-propane-butane (C_3-C_4) fraction, in gas separation.

In the first case the gas is used as fuel. In the second - gas is processed and it is effectiveness largely depends on the availability of the propane and butane components of the fishery in APG. Weight loss commercial oil in this case pay off produce a commercial product the form of LPG. Information about the volume of associated gas and its composition by separation steps is of great practical importance. In particular, on the basis of these data decisions are made about the acquisition of objects of extraction and preparation of oil and gas the necessary equipment, both on capacity and on a set of used systems. Because the process of gas preparation was developed consists of a complex of technological operations. Therefore, the attention of experts attracts high-performance and reliable equipment for the preparation and rational use of associated petroleum gas developed on the basis of individual requirements of users. In our conditions, the target product is LPG - propane-butane (LPG) and stable gasoline (GS). So focus on the issue of determining the optimal conditions for the separation of oil and gas mixture for the second case.

Table-1. Initial and current data on composition of APG.

Composition of associated gas,	Initial stage	Current period
	% mass	% mass
N_2	4,71	2,92
CO_2	2,93	1,02
C_1	28,37	10,98
C_2	16,31	46,86
C_3	22,42	13,59
i-C_4	4,61	3,24
n-C_4	10,6	9,19
i-C_5	3,12	2,48
n-C_5	5,32	5,45
C_{6+}	1,0	3,6
H_2O	0,53	0,57
Other	up to 100	up to 100

METHODOLOGY

The closest in technical essence is a method of stabilizing the oil by heating it and separating it in the presence of hydrocarbon additives on stable oil and gas phase. For reasons that impede the achievement of the above technical result when using the method include the fact that in the known methods is not achieved the required depth of gassing initial oil. The depth of the gaseous components in conventional separation technology for oilfield paragraphs of the oil is limited by the thermodynamic equilibrium of the initial gas-liquid mixture at pressure and temperature of oil separation. For deep stabilization it warm up that involves large material and energy costs. The technical result - increasing the depth of the source-gassing of oil. Said technical result in the implementation of the study is achieved in that in the known method of stabilizing the oil by heating it and separating it in the presence of hydrocarbon additives on oil and a stable gas phase, wherein the oil after separation was subjected to vacuum treatment under pressure, ensuring its boiling in the vacuum zone, and recirculation, and the recycled oil is fed to the intensifier in the form of warmed oil, gas condensate, additives that reduce the surface tension of the liquid, and the recycling process is repeated. In this way, increasing the depth of the source-gassing of oil, by vacuum treatment the boiling oil, i.e., an additional allocation of gas and deeper oil degassing. Flow intensifier also increases the degassing. Method of stabilization of the oil is performed on the system consisting of a separator, which receives the dehydrated oil already and there is a partial separation of gas. Further, the oil via a suction pump is supplied to the vacuum processing device for vacuum treatment, in the form of two concentrically arranged, cylindrical nozzle extending from the input distribution device with perforated walls and of cylindrical and conical baffles. Vacuum based produce oil under pressure, providing boiling in the vacuum area, which is determined empirically and depends on the oil quality and customer requirements.

The recycling process is repeated. To increase degasification in the recycled oil is fed to the intensifier (preheated oil, gas condensate, additives that reduce the surface tension of the liquid). Experiments have shown that the degree of degassing of oil in oilfield items, such as cleaning it from the propane-butane fractions, using the proposed method increases the amount of gaseous phase increases approximately by 20%. This value depends on oil composition and customer requirements. Thus using the proposed method of stabilization of oil will allow to increase the depth of gassing and to increase the content of heavy hydrocarbons in composition of APG.

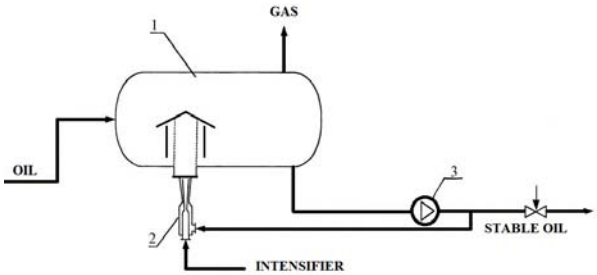

Figure-1. Vacuum separation process.

Vacuum processing of oil is one of the technological processes in the preparation of oil on central oil treatment (COT) that can be used at the final stage of oil separation. This implies that the existing technology of preparation of oil by multistage separation, the process of stripping the oil fields can be applied instead of existing the final stage of separation or after the separation stage end. The entrainment of lighter fractions of the oil in the blow-off process that has been shown experimentally creates conditions for the stabilization of the oil. Experiments on the refining of petroleum products from light hydrocarbons vacuum separation is carried out in the temperature range 35-50 0C and at an absolute pressure of vacuum in the separator in the range of 0.03-0.07 MPa.

Table-2. The expected results on composition of APG.

The composition of associated gas,	The expected indicators
	% mass
N_2	4,15
CO_2	3,11
C_1	26,29
C_2	15,18
C_3	17,37
i-C_4	5,65
n-C_4	13,91
i-C_5	3,01
n-C_5	7,21
C_{6+}	3,2
H_2O	0,87
Other	up to 100

RESULTS AND DISCUSSIONS

Describe expected result:

- based on experimentally verified results of the proposed article emerges the prospect of establishing a more efficient technologies
- on the basis of the results of research data justified the benefits generated by commodity products: liquefied petroleum gas;
- expected research results can be used in oil, gas processing;
- projected socio-economic effects from the use of the results of this study are as follows: (a)) improvement of consumer properties of existing products; b) creating innovative technologies; in the) establishment of theoretical bases and technology of production, preparation and processing of APG.

CONCLUSIONS

a) Substantiated arguments on the need for light hydrocarbon liquids from associated petroleum gas and mixing light liquid hydrocarbons allocated with degassed oil to increase the output of the last and use low-temperature condensation as the fundamental technologies of preparation of associated petroleum gas and the modalities for the implementation of this technology;

b) Reviewed and analyzed existing technologies and processing associated petroleum gas, used for allocating light liquid hydrocarbons (topping) with respect to the fishing settlement of oil fields. Identified a number of processes that must be considered when fishing the preparation of associated petroleum gas, directed at preparing or processing with the purpose of extraction of associated petroleum gas light liquid hydrocarbons;

c) Considered and analyzed the current and project (initial) results of analysis of samples of associated gas;

d) Identified the prospects of practical use for calculating fishing process separating oil and preparation of associated petroleum gas to determine the coefficient of light liquid hydrocarbons extraction in order to select associated petroleum gas preparation technology.

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