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UTILIZATION OF ASSOCIATED PETROLEUM GAS.

Lapin D.G, Fomin D.A
Research supervisor – Doctor of engineering sciences - Kvesko B.B
Chair of foreign languages, language advisor – O.I. Denisenko
Institute of Oil and Gas

Chair Development and operation of oil and gas fields

APG is used to obtain propane-butane, the amount of which on the Russian domestic market is reduced from year to year , but the demand is not increasing.

According to official statistics of CDU TEK , in Russia in 2010 it was produced 65.4 billion cubic meters associated petroleum gas (APG) , of which the flares burned 15.7 billion m ³ (i.e 24 % of production volume) .

There was adopted a number of laws requiring oil companies to stop the unacceptable practice of waste of valuable resources of the country and ensure utilization of not less 95% of associated gas produced.

Level of rational utilization of APG of 95% was not achieved in any of the federal regions. The maximum level of utilization in 2012 was reached in the Far Eastern Federal District - 94%, the lowest level in the Siberian Federal Region - 23%.

Associated gas flaring is the cause of emissions of air pollutants: carbon dioxide, iron, magnesium, and many other carcinogens.

Main components released into the atmosphere from APG, are carbon dioxide and soot.

According to expert estimates 12 percent of the total pollution in Russia are pollutant emissions in flares .

High concentrations of pollutants in the atmosphere adversely affect human health and wildlife. Emissions of carbon dioxide cause the greenhouse effect , which results in the global climate change. Moreover , the combustion gas destructs the soil in radius of 100 to 350 meters from the torch . When burning APG, we expose topsoil and vegetation to intense thermal and chemical effects.

In our paper, we consider the most effective and environmentally friendly methods of utilization of associated gas . Nowadays there are the following methods of utilization:

1. Gas delivery to the gas processing plant. Gas is a valuable source of raw material for the chemical industry.

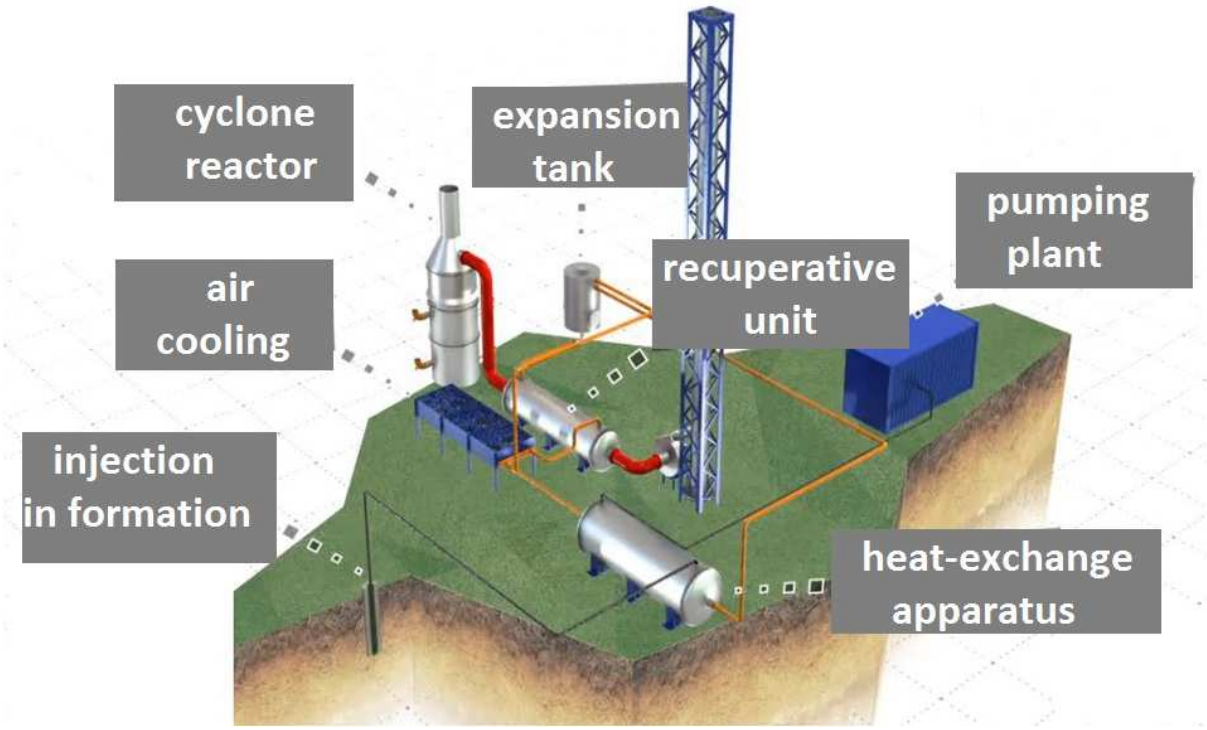
2. Utilization of gas in generators to produce electricity for the needs of industry.

3. Associated gas injection into the reservoir to maintain reservoir pressure. Implementation of this process involves many difficulties such as high capital costs for the construction of compressor stations.

Main directions of gas utilization at Vankor deposit : consumption for own needs, APG injection into the reservoir for pressure maintenance , gas supply to outside customers .

Despite the use of these methods APG utilization rate of 95 % is not achieved. That is why the development of additional methods and technologies for utilization associated gas fields is urgent.

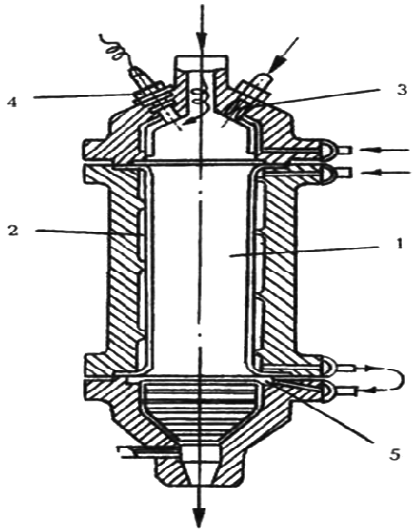
We proposed to use « APG utilization complex » for heat carrier injection. The figure located below is a typical scheme of the complex , the main component of which is the cyclone reactor , located inside a cyclone burners that provide almost complete gas flaring, and the flue gases are used for heating and pumping heat carrier into the reservoir to increase oil recovery .



Complex helps to avoid a large fines for a negative impact on the environment and unsustainable use of associated gas , increases oil recovery efficiency due to thermal effect , makes it possible use to economically profitably APG without harm to the environment. However, this method is applicable only in shallow wells up to 1500m because at bigger depths there are large heat losses.

The example of the Vankor field shows that the depth of the productive layers is more than 1500 m, and so we have proposed a method of using APG injection of heat carrier into the reservoir wells applicable at depths more than 1500m.

The basic idea of this method is the use of steam-gas generator mounted on the well bottom . Steam- gas – is the joint injection of heat carrier and gas (N2 + CO), which allows to improve the ratio of viscosity by reducing the viscosity of the oil by dissolving it in a nitrogen and carbon dioxide while reducing the flow rate of the coolant.



The basic design of steam-gas generator

1 - combustion chamber
2 - Shirt
3 – Nozzle (nose piece)
4 – electrical igniter
5 - water injection nozzle

It has been found that injection of flue gas or C02 together with steam has a positive effect on oil displacement efficiency ,increases rate of fluid from the reservoir , decreases and the steam-oil and water- oil ratios , which is a major factor in improving the efficiency of the combined-cycle process.

- The joint injection of the steam with dissolved hydrocarbon gas (CO, C02) can increase oil recovery and improve operational performance as a result of the expansion of oil, reducing its viscosity and mode of dissolved gas .

It is currently believed that C02 is most effective additive to steam . Other condition being equal, addition to steam nitrogen and flue gas is more effective than a single injection of steam; C02 additive further improves the efficiency of the process.

Список использованной литературы

1. Отчет. Оперативный подсчет балансовых запасов нефти, свободного и растворенного газа Ванкорского месторождения. Москва, 2005 г.
2. Lee, J.W. Well Testing, Society of Petroleum Engineers, Richardson, NX.11 Edition, 2002.
3. Horner, D.R. Pressure Analysis Methods, Reprint Series, SPE, Dallas, 1967.