DEVELOPMENT OF A COLUMN WITH AN OPTIMAL CONSTRUCTION TO INCREASE THE EFFICIENCY OF CLEANING NATURAL GAS FROM SOUR COMPONENTS BY ABSORPTION METHOD OF MUBARAK GAS PROCESSING PLANT LLC

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Abstract: Mubarak gas processing plant is one of the largest gas processing plants in Central Asia. The raw materials at the plant are high- and low-sulfur gases, which are cleaned of sour components by the absorption method. This process is carried out in a plate absorption column, using methyldiethanolamine as an absorbent. Sieve and trapezoidal plates are used in the column. At present, gas processing plants mainly use tubular absorption columns for cleaning gases from acidic components. This article presents the results of an experiment on the purification of high-sulfur gases at the Mubarak gas processing plant using a 40% solution of methyldianolamine in a laboratory column with different types of tubular absorption. By comparing the results obtained from these experiments, it was possible to determine the optimal nozzle type for the process and the optimal hydrodynamic parameters of the process.

Key words: absorber, nozzle, plate, emulsification regime, sour gas.

Energy, transport, electricity, communication, radio are the modern world economy. The increase in human population in the world from year to year also sharply increases the demand for their energy sources. Until now, people in the world have been meeting their needs by developing new types of non-renewable

and renewable energy sources.

Oil and gas are renewable energy sources, but they take centuries or even longer to regenerate. Nowadays, oil and gas are mainly used as raw materials in industry and internal combustion engines, and as raw materials in oil and gas chemical enterprises. Currently, electric cars are being produced in developed countries. However, due to the fact that the engines of electric cars are not as advanced as the internal combustion engine, even in developed countries, vehicles with an internal combustion engine are the main part. Oil and gas have been one of the main sources of energy in the world for more than a century. Therefore, taking into account that oil and gas are the main fuel of internal combustion engines and important raw materials in the oil and gas chemical industry, it is important to use this resource wisely until the alternative energy that replaces oil and gas energy is created in the near future, and to save oil and gas resources to the next generation. leaving a legacy is one of the most pressing problems of today. For this reason, it is important to improve the technologies and equipment designs used in hydrocarbon processing enterprises and to produce high-quality oil and gas products that meet international standards and improve environmental performance.

Absorber columns with plates and nozzles are mainly used to purify gas from acidic components in the absorption method.

In technology, of course, there are more absorption devices, which makes it difficult to choose the most reasonable absorber for each specific situation. Process conditions and requirements for absorbers vary significantly in different industries, so it is not possible to recommend a single absorber that is best for all situations. Basically, the most suitable device for a given process is the one with the highest technical and economic performance. At the same time, the costs for 1 ton of product (for the absorption process - the cost of processing 1 m3 of gas) should be the lowest. To begin technical and economic calculations, you must first select the most types of devices that can successfully solve this specific problem.

There are the following methods of cleaning natural gas from sour components:

Absorption - cleaning of sour gases contained in natural gas over the entire surface using a liquid absorbent (alkanolamines).

Adsorption - purification of acidic components in the gas tank by absorption in the porous part with the help of solid absorbing substances (zeolites, silica gels or activated aluminum).

Chemical method – Hygroscopic salts are usually metal chlorides (CaCl2, etc.).

Most of the natural gas sour components installed in gas processing plants in the world are based on the first two methods.

The advantages and disadvantages of the absorption and adsorption method of natural gas from sour components are as follows:

Advantages of the absorption method for cleaning natural gas from sour components:

Absorption method of cleaning sour components of natural gas is high even when the amount of sour gases in the gas (above 1%) is high;

The ability to separate sour gases when natural gas is purified from sour components by the absorption method;

Disadvantages of the absorption method for cleaning natural gas from sour components:

The process of regeneration of saturated absorbent when cleaning natural gas from acidic components by absorption method is complicated (requires a lot of equipment);

After the natural gas is purified from sour components by the absorption method, the natural gas must be dried.

Advantages of the absorption method for cleaning natural gas from sour components:

When natural gas is purified from acidic components by the adsorption method, the drying process goes together. That is, it does not need to go through the drying process when it is cleaned in the adsorption process;

The regeneration process is simple.

Disadvantages of the absorption method for cleaning natural gas from sour components:

When the amount of sour gas in natural gas is high (more than 1%), the efficiency of purification by adsorption method is low;

The regeneration process is carried out using hot gas. In this case, the regeneration gas is sent to a torch or cleaned by absorption method;

At the Mubarak gas processing plant, the absorption method is used to purify the raw gas due to the high content of sulfur gas. The absorber column is of the plate type and is fitted with a cylindrical plate. Table 1 lists the main technological parameters and design values of the absorber column used at the Mubarak gas processing plant.

Gas consumption m^3/h	Concentration of H_2S in %	CO_2 concentration %	Absorbent consumption m^3/l MDEA	Absorber diameter, m	Absorber height, m	Number of plates
250000	4,5-5	3,30	0, 76	3,20	27,8	24-32

The efficiency of cleaning gases from acidic components in this column is 81-86%. The main disadvantages of the plate absorption column are the small

surface area and mechanical particle clogging of the holes of the plates, which increases the hydraulic resistance of the plates. It is possible to increase the efficiency of cleaning by replacing the internal contact device of this column with a nozzle. The process of purification of raw gas from the Mubarak gas processing plant was carried out in the laboratory tube absorber. The results obtained for the laboratory device are presented in Table 2.

Table 2

Results obtained during purification in a laboratory absorber device

Enter		Exit	
Flow	$\%_{mas}$	Flow	$\%_{mas}$
Including raw gas		Including refined natural gas	
Methane	86,2	Methane	85,8
Ethan	4,5	Ethan	4,3
Propane	2,1	Propane	2,0
Bhutan	0,8	Bhutan	0,75
Carbon dioxide	0,9	Carbon dioxide	0,0065
Hydrogen sulfide	5,5	Hydrogen sulfide	0,048
		loss	7,0955
Total:	**100**	**Total:**	**100**

In the Mubarak gas processing plant, the gas purification efficiency in the plate absorption column is 93.6%. It was determined that the efficiency of gas purification in the tube absorber in the laboratory device is 99.127%. Due to the size of the meeting surface, the efficiency of separation of phases in the tubular absorber is high. In the process of cleaning gas from sour components at the Mubarak gas processing plant, it was found that the efficiency of cleaning increases by 5.527% by using a tubular absorber.

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