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THE ROLE OF INFORMATION COMMUNICATION SYSTEMS IN THE AUTOMATIC CONTROL OF THE GAS REGENERATION PROCESS

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Abstract: Uzbekistan occupies a high place in Central Asia in the production of high-quality oil and gas products. The production of clean quality gas products in the country brings a number of conveniences to the residents of the region. Because the need for electricity and gas energy is currently increasing in all regions of our country. in order to effectively use oil and gas, it is considered urgent to create various innovations and additional opportunities. Today, when energy resources are becoming increasingly limited, environmental safety and production efficiency requirements are increasing, it is important to manage technological processes with the help of information communication systems. Gas regeneration is an important process in the gas industry that allows you to purify gas from excess and unnecessary substances. Meeting the demand and needs for heat and electricity in all sectors of the national economy in our republic is the main problem today.

Key words: High-quality, hydrocarbons, adsorption, automated process, absorbent, thermodynamics.

Introduction: The wet regeneration gas is then sent to the regeneration gas cooler and water is desorbed from the sieves, plus some hydrocarbons are separated. The wet vapor is recycled back to the process and the condensed water and coadsorbed liquid hydrocarbons are removed from the separator under level control. Therefore, it is an urgent issue to obtain environmentally friendly products by processing oil and gas raw materials. The topic aimed at automating the process of gas regeneration and managing it with the help of information communication systems is an urgent issue. The process of removing excess (solid, liquid and gaseous) impurities from industrial gases. It is natural that gases produced during production processes contain various additives [1]. As a result of gas cleaning, valuable products are retained, harmful substances that have a bad effect on further processing or corrode equipment are separated, and impurities released into the outside air are reduced. Absorption of additional substances in gases into liquids during gas purification (adsorption); settling under the influence of electrostatic forces or under the influence of gravity; cleaning with water; one of the filtering methods; absorber, adsorber, etc. devices are used. As an object of automation, the absorber is characterized by differential differential equations. This is explained by the fact that the entire volume of liquid is involved in the process. In order to simplify the models of absorption processes, they are approximated, that is, they are structurally expressed in the form of the usual dynamic links. In this case, the absorption process is characterized by a purely delayed second-order non-periodic term. Due to the large size of the absorbers, they are characterized by large inertia and delay times according to the "absorbent consumption - output solution concentration" channel.

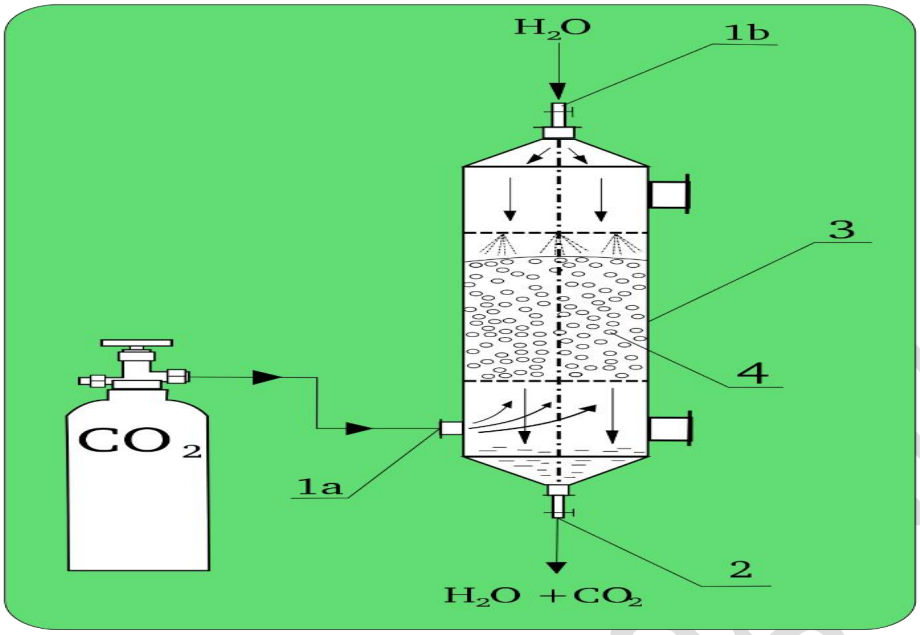

Figure 1. Absorber device

Automated process control refers to the use of various technologies and systems to control and monitor industrial processes automatically. This allows for greater efficiency, precision, and safety in manufacturing and other industries that rely on complex processes. The quantity of water vapor in gas stream strictly controlled where, the efficiency of the gas dehydration is estimated on the amount of water content present in the natural gas [2]. This will help to estimate how much to dehydrate. The first step is evaluating what is the amount of water the natural gas is carrying to select the gas dehydration unit and designing the process. Second is the presence of acid gases affluence the water content treatment. So, when the process is chosen based on the water content but if acid gases are present along with the water, they will influence not only the water content is measured they also influence the process design and the overall process. That is why it is very essential when designing sour gas dehydration units to evaluate the production of water with sour gas in the inlet separator of the plant. The amount of water present in natural gas depends on the process it will be saturated. Moreover, determining the saturated water content of a gas is a standard but complex problem in thermodynamics. There are varieties of methods for calculating water content of the natural gas. We can use some chart data available in the literature to establish the mathematical processor to perform the calculation. This chart also shows if we change operating temperature and pressure, we can see how much water content can be accommodate by the natural gas or by the pure component when it is a mixture [3]. In general, current methods are adequate for lower acid gas concentrations which is less than about 30% but can lead to serious errors at higher acid gas and methane concentrations greater than 50%, especially at higher pressures. In an amine-treatment process, gas is contacted with lean amine solution in the absorber, which the H2S and some of the CO2 are absorbed by the amine. The treated gas is sent to the thermal oxidizer where residual H2S is converted to SO2 before discharge to atmosphere. After a bed has been heated, typically at 170°C–260°C, it is cooled to 30°C–40°C to make it fresh again. Therefore, a regeneration cycle includes both heating and cooling stages. In the process arrangement shown as a slipstream (typically 10%–20% of the raw gas) is used as regeneration gas. Absorption is the absorption process of gas or vapor components in gas or vapor mixtures. Absorbed gas or vapor is called absorbent, and absorbent liquid is called absorbent. This process is a selective and reversible process and serves to separate gas or vapor mixtures.

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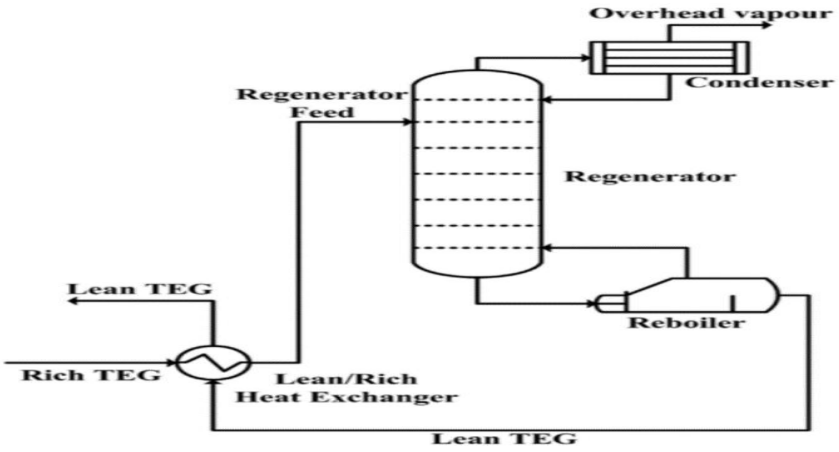

Figure 2. Heating by an overhead condenser

Adsorption is a process in which gas flows through a bed of granular solids that have an affinity for water, most often by mole sieve, silica gel or alumina. Two-bed system is used, as a minimum. Specifically, one bed is for drying gas and the other bed is being regenerated. In this process before natural gas goes to dehydration operation it passes through a separator depending on the composition of the natural gas, to remove the solid or liquid compound before going to adsorption tower [4]. At first the wet gas pass from the top of the tower, due to the reason of high velocity of the gas to not disturb the solids in the tower. The wet gas usually passes through the solid packing and the dry gas comes out from the bottom part of the tower, which can remove most of the water present in the natural gas. Then the dry gas moves to regeneration process, where the solid get free generated so the tower can be used for the next cycle. To make the arrangement, a part of the gas goes through heating process and the heated natural gas pass through the regeneration tower from bottom to be able to remove all the impurities and regenerate the bed for the uses. Then it must go through a cooler before it sent to the separation process. In this case, one regeneration gas scrubber needed to get the water from the separator and collect at the end.

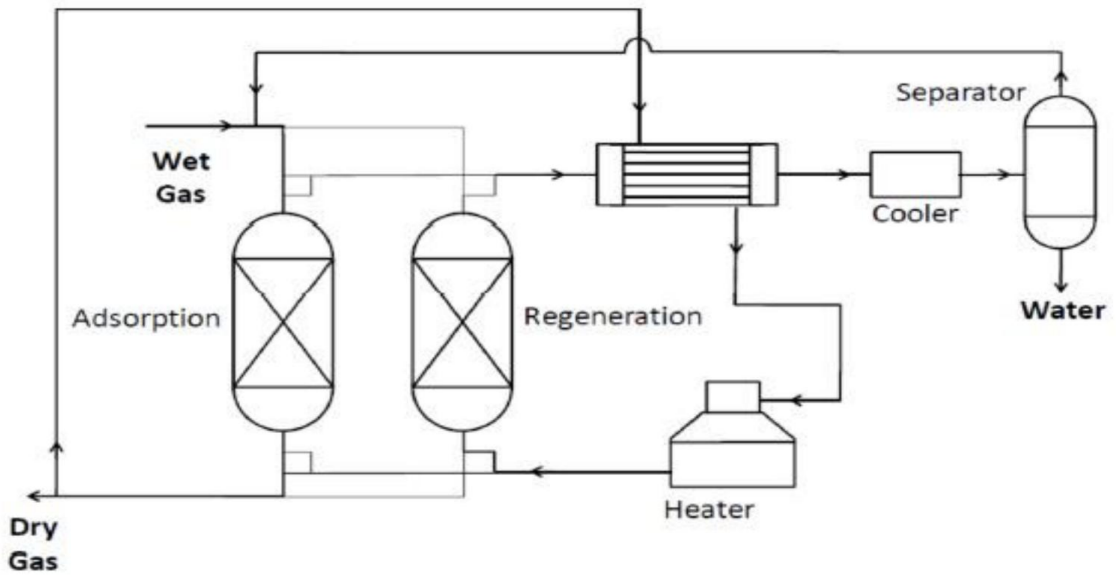

Figure 3. A typical process flow diagram for adsorption dehydration process

This method employs cooling process of gas to convert the water molecule into liquid and then remove from the stream. The condensation technology uses refrigeration of natural gas and once refrigerate the gas the water condensates which can be remove that from the wet gas. Natural gas processing is a current global requirement. The structure of processing plants, installations components, used equipment, products and operating parameters depend on the natural gas composition and flowrate but also on the market requirements and price. One of the finished products of the natural gas processing plant is ethane [5]. The specialized literature dedicated for ethane product deals with three research directions. The first direction is associated with studies on natural gas processing techniques. Natural gas processing facilities use and produce significant amounts of hazardous materials, including raw materials, intermediate/final products, and byproducts. The handling, storage, and transportation of these materials should be managed properly to avoid or minimize the environmental impacts from these hazardous materials. Hazardous waste should be determined according to the characteristics and source of the waste materials and applicable regulatory classification. Processing natural gas to profitably produce end products requires precision and is potentially hazardous. Small changes in a process can have a large impact on the end result [6]. Conditions such as pressure, temperature, flow, composition, and many other factors must be controlled carefully and consistently within specified limits to ensure quality and safety.

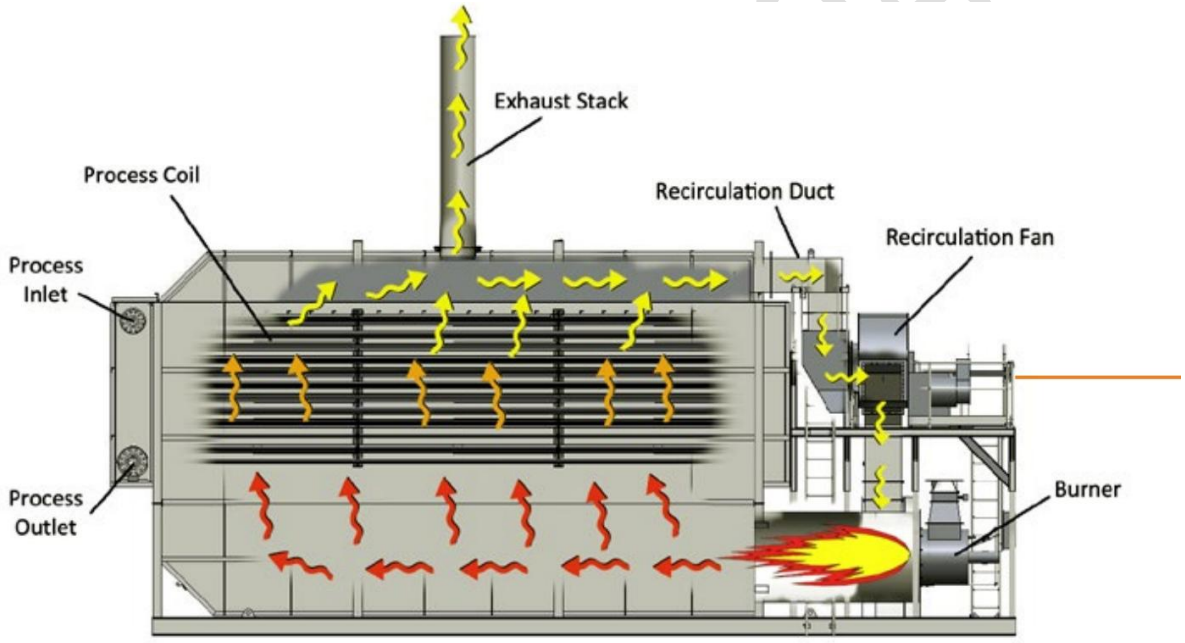

Figure 4. Thermal-Regeneration-Gas-Heating

A well-designed, maintained, and leveraged control system will reduce start-up time, maintain maximum operating profit, avoid forced shutdowns, keep operating and maintenance costs as low as possible, assist in the management of environmental compliance, and support plant safety and security needs without adversely affecting construction costs. An overview of the main control functionalities in the gas processing plant and their applications are described in subsequent chapters. This type of heater requires flowing regeneration gas before the burner can be operated, resulting in a ramp-up time that adds to the overall regeneration cycle time. That ramp-up time can be anywhere from ten to twenty minutes depending on the process and the size of the heater. Starting and stopping the heater between every regeneration cycle results in significant thermal cycling. This thermal cycling will decrease the service life of this heater compared to some other alternatives.

Conclusion: Regeneration is one of the processes in which if an organism is cut into several pieces, each of its parts regrows to the original state. This process is carried out by specialized cells called stem cells. It takes place in organisms that have a very simple structure with very few specialized cells. The objectives of gas processing are to produce transportable gas, meet sales-gas specifications, and maximize liquid recovery. Producing transportable gas to a remote location requires the gas to be delivered without allowing condensation of hydrocarbon (HC) liquids. In an amine-treatment process, gas is contacted with lean amine solution in the absorber, which the H2S and some of the CO2 are absorbed by the amine. The treated gas is sent to the thermal oxidizer where residual H2S is converted to SO2 before discharge to atmosphere.

References:

1. Morosuk T, Tesch S, Hiemann A, Tsatsaronis G, Omar NB. Evaluation of the PRICO liquefaction process using exergy-based methods.
2. Alabdulkarem A, Mortazavi A, Hwang Y, Radermacher R, Rogers P. Optimization of propane pre-cooled mixed refrigerant LNG plant.
3. Ancona M, Bianchi M, Branchini L, De Pascale A, Melino F. Performance increase of a small-scale liquefied natural gas production process by means of turbo-expander. Energy Procedia
4. Wu J, He T, Ju Y. Experimental study on CO2 frosting and clogging in a brazed plate heat exchanger for natural gas liquefaction process.
5. Berstad D, Nekså P, Anantharaman R. Low-temperature CO2 removal from natural gas. Energy Procedia 2012
6. Mokhatab S, Mak JY, Valappil JV, Wood DA. Handbook of liquefied natural gas. Gulf Professional Publishing; 2013.