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Use of modern information systems and control technologies in the automation of devices in the process of gas separation at oil and gas operating factories

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ABSTRACT: this scientific article is aimed at proposing the use of an intellectual method of control, using an ambiguous logic method of controlling the parameters that are important for the processes taking place in the oil and gas industry in the territory of our country. This allows you to adjust these parameters qualitatively and quickly. As an example, the parameters of the gas rectification process are taken, and the block diagram of the indeterminate adjustment in the adjustment of the parameters is given.

KEY WORDS: fuzzy logic, rectification, separation, modernization, oil and gas refining industry, separation.

I. INTRODUCTION

The role of information systems and technologies in today's evolving world is invaluable. There is no industry we can't imagine without them. Especially manufacturing enterprises, large factories and similar organizations. Under the motto of Renewing Uzbekistan, large-scale reforms are being carried out in our country. At the same time, we can see the introduction of modern information systems and technologies in the industry. Large oil and gas refineries are no exception. At the initiative of the President, their modernization has been carried out, nowadays.
Many plans have been set for the introduction of more advanced technologies, especially in the field of automation of processes at production facilities. The more advanced the automation, the better the quality of the product [2,1].

II. THE NEW TECHNOLOGIES IN AUTOMATION.

In recent years, large-scale projects are being implemented at the Shurtan Gas Chemical Complex, which makes a significant contribution to the oil and gas refining industry of our country. In particular, in order to increase production capacity, the project of expanding production efficiency is planned. This will increase the efficiency of the complex and create opportunities for the production of modern, world-class export-oriented products. This may include the production of polymer and its compounds currently being imported.

III. AUTOMATION OF THE PROCESS OF SEPARATION NATURAL GAZ BY RECTIFICATION.

At the Shurtan Gas Chemical Complex, the natural gas passes through the absorption purification process to the rectification separation units. Rectification plants produce a combination of hydrocarbons such as ethane, ethylene, propane and methane. For example, in this factory the methane separation unit at the plant is located in position DA-1801. This device is automatically controlled by several control measuring instruments, intelligent sensors, actuators, signaling devices and controllers. All of these devices are used to receive, process, modify, and store information.
Here A + B + C is a mixture of concentrated substances, or in other words, a stream of natural gas saturated with hydrocarbons coming for separation. The device mounted on the lower part of the column is a heated relay. This heating element (reboiler) is part of the recirculation device, which serves to increase the efficiency of its operation. At

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the bottom of the column, methane is separated by heating a mixture of hydrocarbons that are in a sedimentary state, losing some of their heat energy. The rest of the mixture is then transferred to the next column.
In the next column, methane is extracted from the hydrocarbon mixture. In this device, a mixture of hydrocarbons is transmitted through two streams. At the lower flow, a mixture with lower energy, a lower saturation concentration, and at higher flow, a mixture with a higher energy, methane is released.
Temperature plays an important role in gas separation. This is because the process of separating natural gas depends on the behavior of the components at a certain temperature. The temperature inside the column is constantly controlled. Today we can see that our country prefers to use advanced technologies in the oil and gas industry [5].

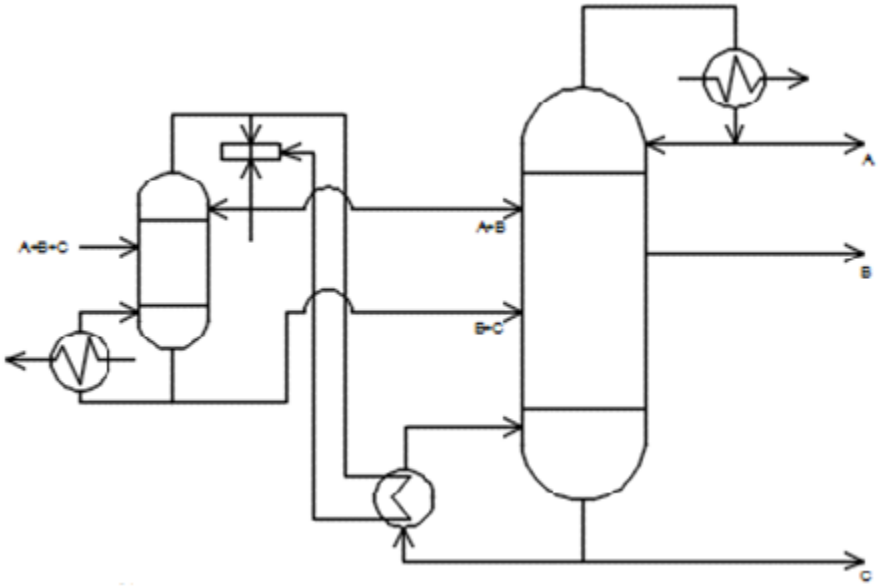

Figure 1. Functional scheme of the process of separation natural gas by rectification.

It is no secret to us that parameter control systems in factories are in classical management. They are adjusted by comparing the parameters measured in the process with experimental data. This affects the quality of the products coming out of the factories.

IV. LOOKING THE WORKING PARAMETRS IN THE GIVEN PROCESS.

The working parameters of the process are as follows:

- G_f, G_{fl}, G_d, G_v - consumption of impurities, phlegm, distillate, cubic residue;

- x_{fl}, x_d, x_v - molar composition of the incoming flow;

- $\tau_м = \dfrac{V_{fl}}{G_d}$ – the number of flegma;

The number of working phlegm is determined using the following formula:

$$R_{\min} = \frac{x_d - y_f}{y_f - x_f}$$

Where, x_d - is the given composition of the liquid phase of the incoming flow;

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y_f - the corresponding composition of the incoming flow vapor phase;

The number of working phlegms is correlated as follows:

$$R = 1{,}3 * R_{\min} + 0{,}3 \text{ or } R = \delta * R_{\min}$$

Where, δ =1.2-2.5 – the number of extra phlegms.
The molar fraction equation of the working composition of the upper part of the column is as follows:

$$y = \frac{R}{R+1} * x + \frac{x_d}{R+1}$$

Where, y, x - molar fraction of vapor and liquid phase at the top of the column; x_d - distillate composition;

$$b_1 = \frac{x_d}{R+1}; \qquad tg\alpha_1 = \frac{R}{R+1}$$

Where, $f = \frac{G_f}{G_o}$, $b_2 = \frac{1-f}{R+1} * x_k$, $tg\alpha_2 = \frac{R+f}{R+1}$.

V. THE SECTIONS OF CONTROLLING THE PROCESS.

The automation of the rectification process consists of the following sections.

1. Adjustment Department.

- Adjust the transmission of phlegm (wetting fluid) - θ_v=f(c_d).
- $P_в$ - adjusting the pressure of the vapor phase in the cold agent flow, according to the material balance - G_{fl}.
- h_{ph} - adjusting the phlegm according to material balance of the upper part of the column - G_{ph}.
- h_{ph} - adjust the phlegm supply according to the liquid phase material balance at the top of the column - G_{fl}.
- h_{ph} - adjust the phlegm supply according to the liquid phase material balance at the bottom of the column - G_{fl}.
- $G_п$ - adjust the input cosuming:

- material balance of all items;
- to solve existing problems;
- on the working surface of the column;
- on the installed production equipment;

2. Control Department.

- Control of all inlet flow temperatures and consumption;
- Temperature - θ_s, $\theta_п$, θ_s, θ_{kn}, θ_{no}.
- Pressure - $P_в$, $P_н$.
- Level - h_{fl}, $h_к$.
- Concentration - c_d or $c_к$.

3. Alarm Department.

- Turn off the h_{fl}, $h_к$, $\theta_s$parameters for the task given;
- $\uparrow P > P_{o'tish}$ - for the extra incriese pressure;

$\downarrow G_k$ - alarm on sudden decrease or loss of input current;

VI. NEW TYPE OF CONTROLLING OF THE PARAMETRS.

Today's advanced technologies suggest the use of intelligent systems to control the measured parameters, the ability to quickly and qualitatively adjust the controlled parameters. An example of an intellectual system is the principle of adjustment by fuzzy logic.
Intelligent control systems are systems that perform the functions of obtaining, adapting, or regulating information about a system by storing and analyzing information about the structure of the object being controlled, its control

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system, and external influences. In such uncertain logic systems, the transformation of the input values of an unknown parameter into a linguistic quantity of reality is a process of classification. The process of developing an indefinite regulator output size is the process of defuzzyfication.
The following is a functional diagram of a control system based on fuzzy logic. It uses intelligent control systems to control poorly shaped, complex technical systems in the form of nonlinear, undefined dynamic objects that cannot be used in simple deterministic and stochastic controllers [1].

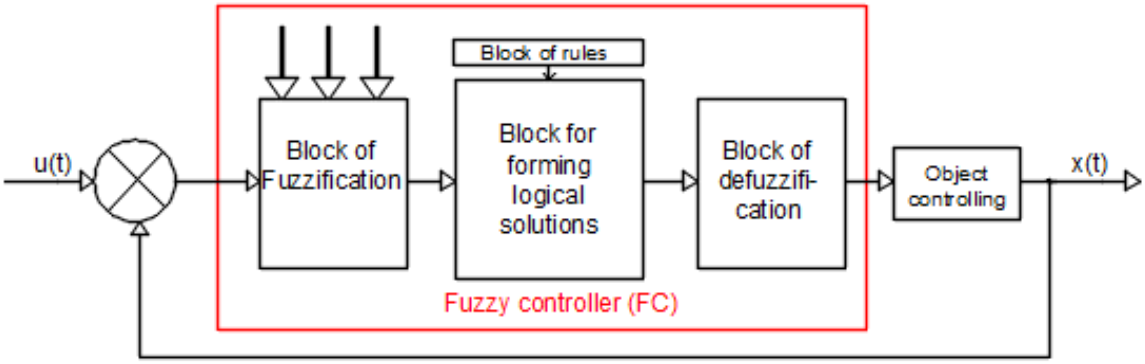

Figure 2. Functional scheme of control system based on fuzzy logic.

Determination of uncertainty (fuzzification). For the terms of the input linguistic variables, the corresponding functions are given in a single universal space, and the degree of validity of each rule is determined for certain values of the variables .
A logical solution. In this block, the calculated validity values for each rule are used to summarize those rules. Logical Inference Minimum or Production operations are often used as rules.
Composition. The height-cut sections of the obtained uncertainty relation function are combined to form a single uncertain resultant relation function for a variable conclusion.
Transferring to accuracy (defuzzification). The indefinite conclusion is converted to a definite number, and the resulting correlation function of the control effect on the control object, obtained in the Defuzzification block, is converted to a numeric value [3].
Now, we can see methane gas produced at the Shurtan Gas Chemical Complex as a finished product is not considered to be completely separated comparing to another plants in the world. Therefore, we are pleased that the "expansion project", one of the most promising projects at the plant, has been implemented.This is because the extraction of oil and gas products, which are the wealth of our people, and their export without full separation will affect the cost of our products. Seeing this, the President noted that many such projects are being implemented.
Another such promising project is the “Uzoltinyul GTL” (gas to liquid) project. This will allow the plant to convert natural gas used in existing production facilities or extracted from domestic gas fields into liquid fuel. And that means we get the right to sell our wealth at whatever price we want [2,2].

VII. CONCLUSION.

Thus, modern control systems are developed, process parameters are controlled and the quality of products produced in factories is improved. It is worth noting that such new projects would be expedient to introduce intellectual management systems in the management of such factories.

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REFERENCES

[1].Yusupbekov N.R., Aliyev R.A., Aliyev R.R., Yusupbekov A.N. Intellectual controlling systems and decision making. –by the state scientific publishing house named "National Encyclopedia of Uzbekistan", 2015.
[2]. www.shgkm.uz –
www.uzoltinyulgtl.uz –
www.rasshereniyashgkm.uz – yellowpages in the google.
[3]. Aliyev R.A., Aliyev F.T and Babayev M.D. Fuzzy process Control and Knowladge Engineering. (Verlag TUV Rheinland, Koln),1991.
[4]. http: //texprog.ru /index.php /biblioteka /90-0-intellectualniy-sistemakh-upravleniya /neclog /140-ppis
[5]. Ivanova G.V., "Automation of technological processes main chemical industries" - Methodological materials for the course of lectures (in two parts),2003, procol №6.