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PREVENTION OF LOSSES IN THE INDUSTRY, NAMELY WHEN USING THERMAL ENERGY IN GAS PROCESSING PLANTS

Normuminov Jakhongir,
Tashkent State Technical University

Nodirkhonova Charoskhon
Tashkent State Technical University

Annotatsiya: *Sho'rtan GCC Markaziy Osiyoda gazni chuqur qayta ishlash va polietilen ishlab chiqarishga mo'ljallangan yagona korxona hisoblanadi. SGST sexida 6 ta qurilma mavjud: markaziy qozon qurilmasi, demineralizatsiyalangan suvni tayyorlash va bug 'kondensatini yig'ish va tozalash moslamasi, azot va havo olish moslamasi, texnologik suvni sovutish moslamasi, yonilg'i tizimi va mash'al. tizimi va ishchi lagerda qozonxona qurish. Quvvatning oshishiga qaramay, natijada ishlash yomonlashmadi. Ish jarayonida asbob-uskunalar xavfsizlik chegarasi bilan qo'llaniladi.*

Kalit so'zlar: *Sho`rtan gaz kimyo majmuasi, gaz va havo bug`i bilan ta`minlash sexi, markaziy qozon qurilmasi, demineralizatsiyalangan suvni tayyorlash, pirogaz, pizoliz pechlari, texnik va ekspluatatsion pechlar.*

Аннотация: *Шортан ГХК – единственное предприятие, предназначенное для глубокой переработки газа и производства полиэтилена в Центральной Азии. В цеху СГСТ имеется 6 устройств: центральное котельное устройство, устройство системы подготовки деминерализованной воды и сбора и очистки парового конденсата, устройство забора азота и воздуха, устройство охлаждения технологической воды, топливная система и факельное хозяйство, строительство котельной в рабочем городке. . Несмотря на увеличение мощности, как следствие, производительность не ухудшилась. В процессе работы оборудование используется с запасом прочности.*

Ключевые слова: *Шуртанский газохимический комплекс, цех подачи пара, газа и воздуха, устройство центрального котла, подготовка деминерализованной воды, пирогаз, пиролизные печи, трубчатая печь, технические и эксплуатационные показатели.*

Abstract: *Shortan GCC is the only enterprise designed for deep processing of gas and production of polyethylene in Central Asia. There are 6 devices in SGST workshop: central boiler device, demineralized water preparation and steam condensate collection and cleaning system device, nitrogen and air intake device, technological water cooling device, fuel system and torch farm, construction of a boiler house in the workers town. Despite the increase in power, as a consequence, the performance didn`t decay. During the process, the equipment is used with a margin of safety.*

Keywords: *Shortan GCC, SGST workshop, central boiler device, demineralized water preparation, pyrogas, pyrolysis ovens, tube furnace, Technical and operational indicators*.

Introduction

"Shortan" GCC was put into operation in 2002, according to the project, raw gas processing and production of processed natural gas, liquefied gas, gas condensate, sulfur and polyethylene products were launched in the complex. The main production processes include purification of raw gas from sour gases, separation of gases (hydrocarbons) by components, thermal cracking of ethane raw materials, production of ethylene, production of butene-1 and polyethylene from the obtained ethylene product. It is known that Shortan GCC is the only enterprise designed for deep processing of gas and production of polyethylene in Central Asia. Like all high-tech production enterprises, Shortan GCC was initially brought to full capacity (project capacity) in 2002-2005.

The Steam, Gas and Air Supply (SGST) plant is considered one of the main plants in supplying the complex's technological areas with high-quality energy resources of various types.

Performs the following tasks (produces energy resources):

- production of vapors at different pressures;
- taking nitrogen and air in gaseous state;
- production of high-quality water completely purified from minerals (demineralized water);
- steam condensate collection, cleaning and return to technology;
- reparation of fuel gas;
- combustion of liquid and monomolecular polymers in high-pressure steam boilers and pyrolysis furnaces;
- cooling of technological water in the main zone of the complex.

There are 6 devices in the SGST workshop: Central boiler device, Demineralized water preparation and steam condensate collection and cleaning system device, Nitrogen and Air intake device, Technological water cooling device, Fuel system and Torch farm, Construction of a boiler house in the workers' town.

Central Boilers device supplies the complex with high-pressure steam. High-pressure steam is produced in two drum-type boilers with natural circulation produced by the American company "ALSTOM".

The function of oven pyrolysis: A pyrolysis furnace is designed to break down saturated hydrocarbons into unsaturated hydrocarbons. Our complex has 3 pyrolysis furnaces designed to produce ethylene by breaking down ethane gas. The pyrolysis process is an endothermic reaction that requires a large amount of heat. Therefore, this process is carried out in special furnaces. The main features of the pyrolysis process are that hydrocarbon raw materials need to be heated in a very short time and quickly cooled down, i.e. "grinding". The design of the pyrolysis oven is designed taking into account these indicators. At present, we are using external heating tube ovens. Installed pyrolysis furnaces are designed to produce ethylene by breaking down ethane gas. The rate of conversion (raw material to finished product) is 83% by weight. Pyrolysis furnaces consist of 2 parts. Convective and radiant parts. In the convective part, high-pressure steam production and heating of raw materials fed to the oven are carried out. In the radiant part, ethane raw materials are consumed in a short time (0.2-0.3 seconds), and pyrogas is obtained from it, consisting of a mixture of ethylene, ethane, acetylene, hydrogen and other hydrocarbons. Pyrogas is absorbed through the radiant pipes and immediately transferred to the primary HEA (hardening and evaporation apparatus) to stop the separation process. In this, high-pressure steam is cooled by water from the production process. In order to ensure the long-term use of the pyrolysis furnace, dimethyl disulfide is sprayed to slow down the process of coke formation. Pyrolysis furnaces work in two modes (Cracking mode, Decoking mode and standby).[1]

Materials and Methods

Pyrolysis ovens consist of 2 parts. Convective and radial parts. The purpose of thermal calculation is to determine heat flows, accounting for the heat required for the production process, as well as the definition of heat exchange surface and required fuel consumption. The energy balance of various devices is usually presented in the form of an equation that shows how much energy came in and how much went out during the flow process.[2] Based on the law of conservation of energy, an energy balance is compiled, from which it follows that in a closed system the sum of all energies is constant. For CTP, a heat balance is usually compiled:

$$\sum Q_{inc} = \sum Q_{cons} \quad (1)$$

where $Q_{inc.}$ - incoming heat (heat of combustion of fuel, heat of reaction),

Q_{cons} - consumed heat (heat leaving with flue gases, heat spent on heating raw materials)

The law applied to the heat balance of the pyrolysis process energy conservation is formulated as follows: “The amount of heat Q_{inc} coming into this apparatus must be equal to the heat consumption Q_{cons} in the same apparatus”.

For continuous devices, the heat balance is most often made up for the duration of the processing cycle.[3]

Calculation of the heat balance is carried out according to data taken from material balance, taking into account the thermal effects of chemical reactions and physical transformations occurring in the apparatus, taking into account the supply of heat from the outside and its removal with the reaction products, as well as through the walls of the apparatus.[4]

For a tube furnace, additional quantities required in the future for technological calculation (such as: temperature of the beginning, end of the reaction).[5]

The heats included in the furnace heat balance equation:

$$Q_1 = Q_2 \quad (2)$$

$$Q_1 = G_g(q_0 - q_a) \quad (3)$$

Q_1 - is the amount of heat that is spent on heating the gas-vapor mixture in the reaction coil, where G_g - is the mass flow rate of the gas mixture; q_0, q_a - are the enthalpies of the gas mixture at the ambient temperature and the reaction start temperature, respectively.

$$Q_p = \Delta H \sum G_i^{`} \qquad (4)$$

Q_p - is the amount of heat consumed for the pyrolysis reaction,

where ΔH - is the thermal effect of the reaction, kJ/kmol of raw material;

$\sum G_i^{`}$ - kmol/h is the molar hourly consumption of raw materials.

$$Q_2 = G_{p.g}(q_k - q_a) \ldots\ldots\ldots\ldots\ldots\ldots \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Q_2 is the amount of heat that is spent on heating the gas-vapor mixture,

where $G_{p.g.}$- is the mass flow rate of the gas-vapor mixture;

q_k, q_a are the enthalpies of the gas-vapor mixture at the temperature of the end and start of the reaction, respectively.

Thermal balance of the firebox:

$$Q_r = B(Q_r^a \eta_f - q_{fp}^g) \qquad (6)$$

where B - is fuel consumption; Q_r - heat consumption for the reaction ($Q_r = Q_p + Q_2$);

Q_r^a- lower calorific value of fuel; η_t - efficiency – furnaces. $q_{fp}^g -$ is the enthalpy of outgoing flue gases; B - fuel consumption, kg/h.

$$Q_3 = q_2 * B \qquad (7)$$

Q_3 - is the heat carried away by the flue gases,

where q_2 - is the enthalpy of the flue gases.

$$Q_{com} = \Delta H_{com} + B \qquad (8)$$

Q_{com} is the calorific value of the fuel,

where $\Delta H_{combustion}$ - is the sum of the enthalpies of the combustion reactions of the fuel components; B – fuel consumption, kg/h.

Q_{loss} - heat loss.

Results and Discussion. Let's determine the lowest calorific value of fuel (in kJ/m^3) according to the formula:

$$Q_r^a = 360.33 * r_{CH4} + 590.4 * r_{C2H6} + 631.8 * r_{C2H6} + 413.8 * r_{H2} + 715 * r_{CO} \qquad (9)$$

where r_i - is the content of the corresponding components in the fuel, vol. %

$$Q_r^a = 360.33 * 94 + 631.8 * 2 + 913.8 * 4 + 213.8 * 3.7 + 715 * 3.5 = 49040\ kJ/kg \qquad (10)$$

Table 1 - Composition of fuel (fuel gas for the period of operation)

Components	**Molecular mass M_i**	**Volumetric share**	**$M_i r_i$**	**Mass %** $g_i = \frac{Miri}{Miri} * 100$

CH_4	16	0.94	05.04	93.37
C_2H_6	30	0.02	0.6	3.72
C_3H_8	44	0.004	0.18	1.09
H_2	2	0.03	0.06	0.37
CO	28	0.002	0.06	0.35
CO_2	44	0.004	0.18	1.09
Σ				100.00

pressure at the delivery boundary 0.39 MPa (4 at)

maximum pressure (calculated for strength) 1.08 MPa

temperature at the border of delivery 80-90 ^{0}C

Conclusion. Performed hardware, mechanical and thermal calculations showed the reliability of the main and auxiliary equipment of the production process after increasing the capacity.

Technical and operational indicators have not deteriorated, since the equipment is made with a margin of safety.

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