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DeSulfurization of Natural gases in Sheberghan using the Modified Claus method

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Abstract

This article examines the process of deSulfurization of natural gases in Shaberghan City, Jawzjan province, using the modified Claus method. The main goal of this research is to convert hydrogen sulfide (H_2S) in natural gas into pure Sulfur and prevent environmental pollution caused by burning this gas. Because Sulfur is an important element in Sulfuric acid production industries. Shebarghan gas fields, including Yatim Taq, Khaje Gurdak, Jargadoq, and Shukrak, are rich sources of natural gas containing hydrogen sulfide (H_2S) that need to be purified and deSulfurized.

The research method includes field and library studies. By visiting gas fields, sampling and laboratory analysis have been done. Also, reliable scientific sources and specialized articles have been used for enrichment and documentation.

The results of this research show that using the modified Claus method deSulfurization unit, it is possible to recover 99% of pure Sulfur. This process not only helps in the production of Sulfur but also prevents the pollution of the environment, and the production of acid rain. The produced Sulfur has wide applications in various industries, including the production of Sulfuric acid and chemical fertilizers.

Finally, the article emphasizes the importance of developing desulphurization units in Sheberghan gas fields and suggests that considering the scientific and technological advances, more research should be done on the optimization of this process and the use of new catalysts. These measures can lead to the maximum efficiency of pure Sulfur production and minimum environmental pollution and help to improve the quality of life in Afghanistan in such conditions.

Keywords: Sulfuric acid, Sulfur, Modified Claus, Natural gases, Hydrogen Sulfide.

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1. Introduction

Sheberghan natural gas is one of the largest energy sources in northern Afghanistan. There are nine gas fields in the province, four of which are currently active, namely Yatam Taq gas field, Khaja Go gar dak gas field, Jarqduq gas field, and Shakark gas field. These four gas fields produce 380,000 m3 of Sulfur-containing gas per 24 hours [1].

There is a gas sweetening machine in the third orphanage of Tagh-e-Sheberghan, where sour gases are transferred to this machine after extraction and separated from it by a solution of methyl di ethanol, amine, hydrogen sulfide (H_2S), and carbon dioxide (CO_2). The sweet gas is sent to the consumer, The gases containing H_2S are burned after regeneration, Which produces the toxic compound Sulfur dioxide (SO_2). On the one hand, it causes environmental pollution on the other hand, it causes the loss of a valuable substance called Sulfur. Environmental laws prohibit the release of this gas into the atmosphere. Therefore, H_2S should be converted into Sulfur, which on the one hand prevents environmental pollution, and on the other hand, raises the level of the country's economy [2].

Sulfur is often obtained from the depths of the earth, coal, oil, and natural gas. This element is mostly used in the production of Sulfuric acid, the preparation of agricultural fertilizers, the preparation of paints, and spices, the preparation of paper pulp, leather making, sugar industries, and The preparation of fibers. It is used in synthetic materials, explosives, plasticization industries, rubber manufacturing, spraying against fungi, and insecticide production [3].

During the refining of oil and gas, hydrogen sulfide (H_2S) is produced as a by-product and one of the most toxic and odorous gases, which produces the toxic gas Sulfur dioxide (SO_2) during combustion with oxygen [4].

Sulfur dioxide is one of the most important environmental pollutants its emission in the air causes air pollution, acid rain, water pollution, and exacerbates cardiovascular and respiratory diseases in humans [5].

Therefore, because of the above considerations, there are many methods for the deSulfurization of natural gases, among which the Sulfur recovery unit (SRU) with the modified Claus method is of great importance. The Claus process was invented by a German chemist named Friedrich Claus in 1883, but the production of Sulfur by this process was not cost-effective. In 1937, a German company called Farben developed a variation of the device that became known as the modified Claus. The Claus correction process prevents both environmental pollution and the combustion of H_2S Sulfur [2].

The main purpose of the modified Claus process is to convert H_2S into Sulfur and prevent the emission of harmful gases to the environment. The acidic gas (H_2S) is converted to Sulfur in two steps in the modified Claus unit. One-third of H_2S is converted into SO_2, water, and Sulfur in the furnace by reacting with burnt air, and two-thirds is converted into Sulfur in catalytic converters in two to three stages [6].

2. The basic equipment of the Claus unit

The basic equipment of the Claus unit includes acid gas drum or water gas separator, air blower or compressor, combustion furnace, steam boiler or waste heat boiler, coalescer, Sulfur condenser, preheater or heat exchanger, fluidized bed reactors, liquid Sulfur accumulation vessel, Sulfur dryer or pelletizer and incinerator [7].

2.1. Acid Gas Knock Out Drum (AGKOD)

Acid gases exiting from sweetening units enter a vessel called the Acid Gas Knock Out Drum (AGKOD) through a pipeline, where liquids accompanying the acid gas from the sweetening device are separated. These liquids consist of water and heavy hydrocarbons. If these liquids are transferred with acid gas to the reaction furnace, it can cause corrosion in the system, reduce the efficiency of catalytic converters, extinguish the interaction furnace flames, and increase side reactions. This vessel is made of non-corrosive steel and equipped with moisture traps, and two pumps that remove liquids from the drum by one pump and transfer acid gas to the Sulfur recovery unit (SRU) by the other pump [8].

2.2. Air Blower

In the Claus process, air blowers from multistage centrifugal compressors are usually used. The driving force of this device can be electric or steam turbines, In this unit, we use a steam turbine because the steam produced from the steam boiler is used in this device so equipped with electricity if needed.

The operation of this device is such that initially, the incoming steam enters the turbine through a valve, which sets the turbine blades in motion and consequently sets the turbine shaft in the compressor shaft into motion and the incoming air to the blower, It filtered and enters the reaction furnace [9].

2.3.Reactor Furnace

This section is the most important part of the Claus Sulfur recovery unit (SRU), also known as the reaction furnace. In this device, fuel materials, acid gases, and air are separately introduced. At a temperature of 800-1200°C, 1/3 of H_2S is converted to SO_2, Sulfur (S_2), and water in this device. However, care should be taken to control the airflow in this device; otherwise, a different combination of SO_2 in the form of SO_3 will be produced, which with water H_2SO_4 will cause equipment corrosion and poisoning of catalytic converters. If this process continues, the entire operation will stop due to catalytic converter replacement and equipment repair. The thermal duration of combustion interactions is very short, lasting 0.6-1.5 seconds, and its fuel is gas [10].

The interaction furnace is based on the interaction of H_2S in acidic gases, where 1/3 of this gas must be mixed with air and burned to produce the required SO_2 for Claus interaction with the remaining 2/3 of acid gases [11].

2.4.Waste Heat Boiler (W.H.B)

Due to heat absorption in the reaction furnace, liquefaction of Sulfur vapors increasing device capacity, gases exiting the reaction furnace enter a device called a waste heat boiler (W.H.B). In some Sulfur recovery units, W.H.B is separate from the reaction furnace, but

in the modified Claus unit, the waste heat boiler and reaction furnace are combined in one vessel. [8] Gases exiting the reaction furnace at temperatures of 800-900°C pass through internal pipes of the waste heat boiler, transferring their heat to produce steam. At this point, Sulfur produced in vapor form is converted to liquid Sulfur, and the steam produced is used to drive steam turbines and air compressors while the Sulfur produced from the bottom part of W.H.B enters the coalescer (Sulfur separator) [8].

2.5.Coalescer

The coalescer in the Sulfur recovery unit is used for separating Sulfur after the steam boiler and after each condenser. Although most of the Sulfur is converted into liquid in the condenser from gas streams, a certain amount of Sulfur remains as a gas along with other substances entering the reactors. This can lead to poisoning of catalytic converters. To completely separate Sulfur from the gas mixture in the modified Claus unit, four coalescers are present: one after the steam boiler (WHB) and three after each condenser.

The coalescer after WHB separates Sulfur into a liquid form from gases exiting it and sends it to the Sulfur storage tank while other gases after passing through the heat exchanger enter the first catalytic reactor. The coalescer after the third condenser is prepared to prevent steam entry into the incinerator, increase heat in the incinerator due to burning Sulfur, and prevent environmental contamination [11].

2.6.Sulfur Condenser

The main task of a Sulfur condenser in the Sulfur recovery unit (SRU) is to cool down gases exiting from reactors to liquefy the produced Sulfur in the Claus process and separate this liquid Sulfur from the unreacted gas flow. The better operation of the condenser in separating Sulfur leads to improved performance of the next reactor. The temperature in these condensers should be such that solid Sulfur does not form because if solid Sulfur enters the reactor catalytic converter with gas, it can lead to catalytic converter poisoning [8].

The Sulfur recovery unit (SRU) at Yatem Taq Shebrghan is equipped with three heaters, three interaction reactors, and three coolers or condensers prepared. The produced Sulfur before entering the next stage is collected by a liquid condenser and stored in a storage tank from the gas stream exiting into a storage tank [9].

2.7.Reheaters

As previously mentioned, when liquid Sulfur is separated in the condenser from gas, before entering the catalytic reactor, it is heated to a desired temperature in a reheater. The reheater can be direct or indirect; if it is direct, it is heated by a stream of hot gas exiting from the reactor and if it is indirect, it uses another heat source for heating such as hot steam, fire, or an electrical source.

In the Sulfur recovery unit for natural gas at Yatem Taq Shebrghan opening up gases exiting from condensers a stream of hot gas exiting from WHB is used for reheating. However, due to high temperatures causing corrosion, pipes inside reheaters are made of stainless steel [11].

2.8.Converters

Catalytic reactors are also called catalytic converters, or Sulfur converters if these reactors are horizontal and the channels where the catalysts are moved are 48-36 inches deep. These reactors will be installed very precisely if lack of attention in the installation will cause a lot of damage to the unit, even causing it to stop working. The sulfur production rate for the practical class is 96-90% with two reactors and 98-95% with three reactors [12].

Converters are prepared in the deSulfurization Unit (S.R.U) for converting hydrogen sulfide to elemental Sulfur. The exhaust gases from the coalescer first enter the first reactor and are catalyzed as a result of the reaction between H_2S, SO_2, Sulfur, and water in the form of steam.

$$H_2S + 3/_2\ O_2 \longrightarrow SO_2 + H_2O \quad DH = -760Kj/gmol$$

$$2H_2S + SO_2 \longrightarrow 3/_2\ S_2^{+}\ 2H_2O \quad DH = -147Kj/gmol$$

$$3/_2H_2S + 3/_2\ O_2 \longrightarrow 3/_2S_2^{+}\ 2H_2O$$

The above reaction is exothermic, that's why the temperature in the reactor is increased. As we already know, COS and CS_2 compounds will be hydrolyzed by H_2S in the reactor at 4000C. Therefore, the temperature of the reactor must be kept high. More H_2S is produced. Usually, reactor 1 is kept at 450-4800F, reactor 2 at 390-4300F, and reactor 3 at 370-4100F [13].

The method of placing the catalysts in the reactors is such that first the alumina catalysts are placed in the upper part, then the cobalt-molybdenum catalysts are placed in the bottom to prevent the particles from escaping. But in the first reactor, the catalysts are cobalt and molybdenum, and in the second and third reactors, the catalysts are alumina. As we go from the first reactor to the second and third reactors, the amount of H_2S decreases, but to avoid polluting the environment. A zest reactor is an essential Sulfur accumulation container [8].

After the elemental Sulfur is produced in the deSulfurization unit, it is collected by Pailin in a cement container called the Sulfur pit, and a steam heating coil is used to keep it molten. Although this container does not affect the deSulfurization process, if there is a problem, the deSulfurization process must be stopped. To prevent combustion and explosion, consider the following [9].

This tank has a capacity of about 1200m3, it records the temperature and indicates the height of Sulfur. The capacity of the tank is limited because the molten Sulfur is continuously sent by the pump to the Sulfur solidification device [8].

2.9.Incinerator

The waste incinerator is the last part of the deSulfurization unit, the unreacted gases enter the waste incinerator and are converted into SO_2. The main purpose of waste incineration

is to burn all Sulfur impurities and convert them into SO_2 so that the maximum permissible limit of these compounds outside the chimney should not be more than 300PPM. The operating temperature of this unit is 6500C, and the following goals can be achieved by installing the garbage incinerator [3].

1- Oxidation of all remaining citrus H_2S, COS, CS_2, CO, H_2, and elemental Sulfur in the exhaust gas of the deSulfurization unit [14].

2- Minimizing environmental pollutants such as H_2S, COS, CS_2, CO, NOX, etc.

3- Preventing the dispersion of polluted gases in the deSulfurization unit. [8]

3. DeSulfurization catalysts in S.R.U

The catalysts used in this process are mostly alpha or gamma aluminum oxide (Al_2O_3). But to increase the resistance of catalysts against heat and poisons, catalysts such as TiO_2/Al_2O_3, TiO_2, $FeSO_4/Al_2O_3$, and Co-Mo/Al_2O_3 are used [15].

3.1.The role of catalysts in the desulfurization process

In the modified Klaus process, the material enters the reactors from the interaction furnace. This stream mainly contains hydrogen sulfide and sulfur dioxide, formed sulfur and by-products including citrus fruits such as$H_2O, NO, NH_3, SO_3, S_2, COS, CS_2, CO, N_2$ A large amount of sulfur is separated in the thickening units. The rest of the formed gases interact in the catalytic bed and sulfur is produced as the desired product and other products such as water, carbon dioxide, etc.

3.2.Aluminum oxide catalyst (Al_2O_3)

Aluminum oxide is the first catalyst that was used commercially in low-temperature reactors, activated carbon was stabilized with 6.6% silicon. This catalyst had a very high surface area (more than 1000 m2⁄gr) and a high volume of pores. Despite these features, an active aluminum catalyst was preferred. Aluminum catalysts have a very high activity and are relatively cheap compared to other materials, so they are widely used as modified Claus catalysts.

4. Description of the DeSulfurization process using the Modified Claus method

The deSulfurization unit (Claus unit) is named after Carl Friedrich Claus, a famous German chemist who studied at Marburg University from 1846-1848 and then moved to Liverpool, England in 1852. He became a British citizen in 1855 and lived in Liverpool, Warrington, Middlesbrough, and London. Over the years, he received several awards for his inventions, including the Desulphurization Unit (S.R.U.). In Claus's original process, a mixture of H_2S gas and air was passed over a preheated catalyst bed. The final products included Sulfur, water, and heat. Interactions were best performed at temperatures between 400-600 F (93-204 C). The heat recovery was poor because the heat produced was wasted as a result of the interactions. Only low concentrations of hydrogen sulfide

could be produced without additional heating of the reactor. In 1938, the engineers of I.G. Farben solved these problems by developing the modified Claus process. The modified Claus process consists of a combustion step and a catalytic step. This form works as the best modern desulfurization unit (SRU) [16].

The gas injected into Claus operation is the modified Sheberghan natural gas, which contains H_2S (sour gas) in the third accumulation of Yatim Taq Sheberghan, When it is extracted from the well, after preliminary treatment, it is injected into the gas sweetening device In this gas unit From the lower part of the absorber, methyl di ethanolamine solution is injected by the pump from the upper part of the absorber tower, Due to the contact of the solution with the sour gas H_2S and CO_2, it is absorbed by the methyl di ethanolamine solution and the gas is sent to the consumer from the upper part of the absorber. The saturated solution that has absorbed H_2S and CO_2 leaves the lower part of the absorber tower and returns to the Desorber. Before this solution enters the Desorber it first enters the heat exchanger. It is heated by the unsaturated solution that comes out of the reboiler and enters the sock filter, where solid particles and mechanical materials are separated from the solution. Later, it enters the carbon or charcoal filter. The composition of the saturated solution is separated, later, the solution leaves the charcoal filter and enters the Desorber tower until the solution is regenerated again from the presence of H_2S and CO_2. The extracted mixture of H_2S and CO_2, known as acid gas, is transported to the Claus unit for Sulfur recovery [2].

The gas output from the sweetening unit of Yatim Taq's third accumulation is analyzed in the laboratory according to Table (1). After determining the percentage of acid gases, it enters the Claus operation. [17]

Table 1. Characteristics of acid gas entering the Claus unit

No.	**Table column subhead**	**Subhead**
1	Temperature	125°F
2	Pressure	10 psi
3	Components	Percentage
4	H_2S	32.5
5	CO_2	52.3
6	CH_4	1

According to the percentages listed above, it can be seen that the acid gases of Yatim Taq Sheberghan do not contain heavy hydrocarbons, therefore the heat of the fuel in the combustion furnace is considered less. The input and output gases in the combustion furnace are as follows.

In the Claus device, acid gases and air first enter the combustion chamber at a temperature of 12000C 800 - 33% or 1/3 of the share of H_2S gas is converted to SO2, Sulfur, and water with oxygen.

$$2H_2S_{(g)} + (1 + a)\, O_{2(g)} \longrightarrow 2H_2O_{(g)} + \left(\frac{2-a}{n}\right) S_{n(g)} + aSO_{2(g)}$$

In the above equation, a is the molar ratio of oxygen, which can range from 0 to 2, and n is the number of Sulfur atoms, which can range from 2 to 8. The zero value for the

parameter a is related to the thermolysis of H_2S. And the value of 2 is related to not performing thermal decomposition interaction. More S2 is produced in the combustion chamber and S_8 in catalytic reactors. After the combustion chamber, the mixture of H_2S, water vapor, and liquid Sulfur enters the boiler [3].

In the combustion furnace, a certain amount of H_2S interacts with SO_2, turns into Sulfur and water, and transfers heat to the recovery boiler. The overall interactions of this operation are as follows.

$$H_2S + 3/_2\ O_2 \longrightarrow SO_2 + H_2O \qquad \Delta H = -760Kj/gmol$$

$$2H_2S + SO_2 \longrightarrow 3/_2\ S_2^{+}\ 2H_2O \qquad \Delta H = -147Kj/gmol$$

$$3/_2H_2S + 3/_2\ O_2 \longrightarrow 3/_2S_2^{+}\ 2H_2O$$

As seen in the reactions above, both reactions are exothermic, and in addition to oxidation, and H_2S, other reactions also take place in combustion.

$$NH_3 + \frac{3}{4}\ O_2 \rightarrow \frac{1}{2}\ N_2 + \frac{3}{2}H_2O$$

$$H_2 + \frac{1}{2}\ O_2 \rightarrow \frac{1}{2}\ H_2O$$

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

$$C_2H_6 + \frac{7}{2}\ O_2 \rightarrow 2CO_2 + 3H_2O$$

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

As can be seen in Table 1, the percentage of CO_2 is high compared to H_2S, so CO_2 is combined with H_2S as a result, COS and CS_2 are formed according to the following interactions. As can be seen in the above interactions, both interactions are exothermic. , and in addition to the oxidation of H_2S, other interactions also take place in the combustion furnace.

$$CO_2 + 2H_2S \rightarrow COS + 2H_2O$$

$$CO_2 + 2H_2S \rightarrow CS_2 + 2H_2O$$

After oxidation in the combustion furnace, the mixture of gas enters the heat recovery boiler (Waste heat boiler) [16].

In the heat recovery boiler, the gases coming out of the furnace interact with the production of cold steam. This device (WHB). It is a heat exchanger in which the gases coming out of the interaction furnace, which has a temperature of 800-12000C, are cooled to 3700C and enter the coaliser, where the gases are cooled to 2320C and the Sulfur is separated in liquid form [10].

Steam generated from (WHB). It is used to heat the gas mixture before entering the catalytic reactors and steam turbine compressors, it is not shown in Figure [6]

Sulfur is removed from the lower part of the Coaliser is sent to the storage, as the mixture of gases is removed from the upper part of the condenser and enters the first heat exchanger, where it is heated to 320-4000C by steam from the boiler. In the first reactor, in the presence of the catalyst, H_2S and SO_2 interact and Sulfur is produced in the form of gas. If Sulfur is in liquid form, it is deposited on the catalysts and as a result, it poisons the catalysts.

$$2H_2S_{(g)} + SO_{2(g)} \longrightarrow 3/nSn + 2H_2O \quad \Delta H = -41.8kj/mol$$

About 90 percent of the first Claus rector is filled with titanium (Ti) catalysts, which can increase the hydrolysis of COS and CS_2 citrus fruits.

$$COS + H_2O \longrightarrow CO_2 + H_2S$$

$$CS_2 + 2H_2O \longrightarrow CO_2 + 2H_2S$$

The total gases are removed from the first reactor and enter the second condenser, where it is cooled to 1800C until the gaseous Sulfur is separated from the gases. After the condenser, the gases enter the second coaliser until the Sulfur is completely removed from the gases. After degassing, the liquid Sulfur is sent to the Sulfur storage by the pump, and the H_2S and SO_2 gases that did not react in the first reactor enter the heat exchanger, heated up to 2400C, and enter the second reactor. It leaves the rector and enters the condenser. In this condenser, it is cooled twice until the Sulfur is separated from the gas mixture in liquid form, After degassing, the Sulfur is sent to the Sulfur storage, and the remaining gases in the exchanger are heated up to 2000C and enter the third reactor. After the last interaction, it leaves the third reactor and enters the last condenser. After separating the Sulfur in liquid form, it enters the last Coalizer. Here, the Sulfur It completely separated from the gases and sent to the Sulfur storage, and the remaining gases are instead If the slave is burned, it will be recovered again in the modified Claus operation, which does not cause any pollution to the environment which is described below [3].

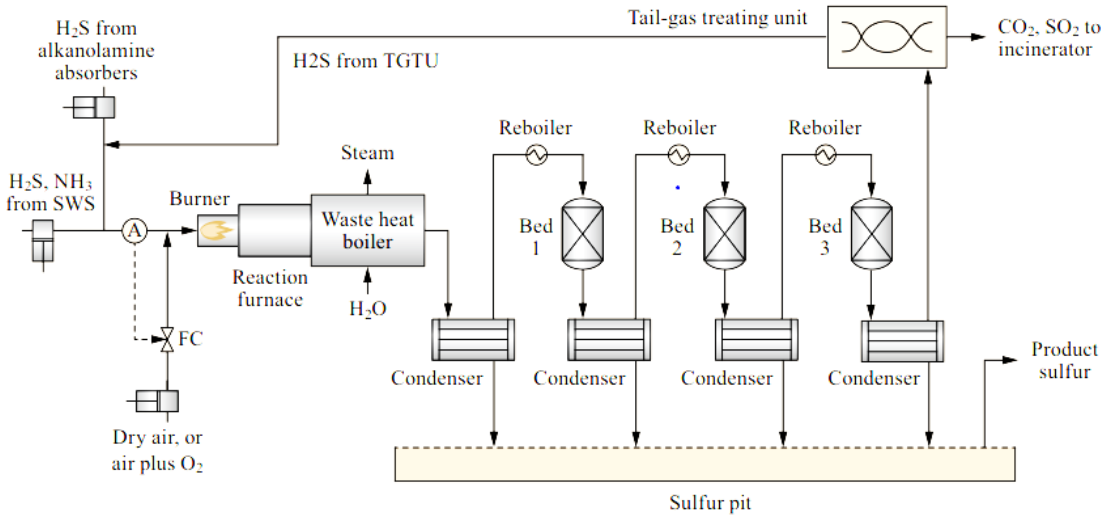


Fig. 1. Modified Claus unit. [16]

5. Purification of non-interacting gases

In the modified Claus operation to increase the amount of Sulfur and prevent the environment from being polluted, we used non-interacting gas purification in the continuation of the Claus operation, the steps of which are as follows. 1- Heating the gases released from the last stage of Claus and converting all the compounds into H_2S by the hydrogenation process. 2- The exhaust gases are cooled and dehydrated by a heat exchanger. 3- Absorption of H_2S by the amine solution and then removing it from the solution in the reactor tower and returning it to the Claus process. In order to separate H_2S from non-interacted gases, we do not need to build a separate unit. It is sent to the sweetening unit in a rotating manner, and its H_2S is returned to the Claus unit [15].

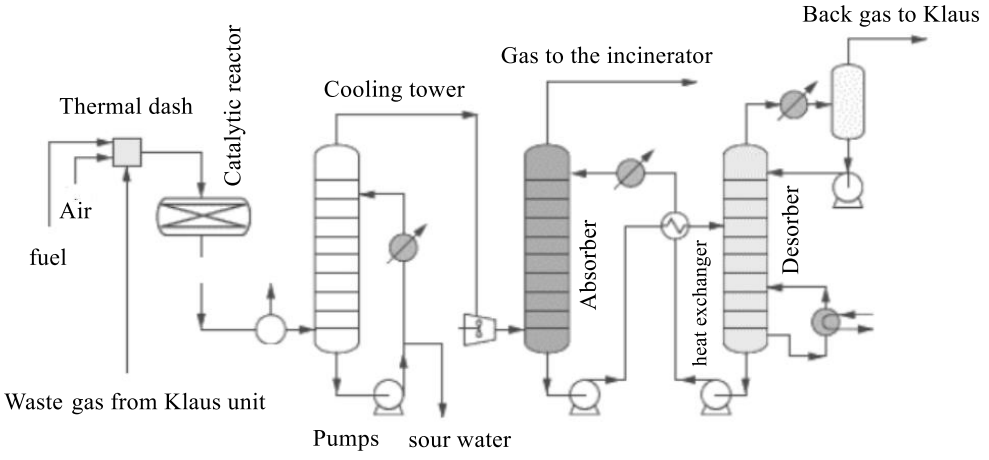


Fig. 2. Claus non-interacting gas treatment unit [18].

6. Star Outline Sulfur Degassing

Liquid Sulfur produced in SRU contains dissolved H_2S and H_2Sx (polyhydrogen Sulfide). During the transportation of Sulfur and controlling the presence of H_2S in the liquid due to its toxicity and risk of explosion, it can cause safety and environmental problems, as well as during its storage in storage tanks, due to the presence of the same small amount of H_2S as in liquid Sulfur. Explosion and ignition will have a bad effect on its solidity, especially on strength. Therefore, due to the reduction of H_2S in the amount of 10ppm by weight, liquid Sulfur is transferred to a horizontal separator and degassed before it is transferred to the Sulfur storage, This operation is done using experimental methods through The difference in weight and weight, the amount of H_2S in liquid Sulfur will be minimized, after degassing, it will be transferred to the Sulfur warehouse by a pump and transfer pipes prepared for this purpose, and then from there again by a pump to We transfer Sulfur solidification unit [6].

7. Solidification of Sulfur

More than 50% of the Sulfur needed by people is obtained from crude oil and natural gas, and the rest is obtained from Sulfur mineral sources. In most operations, such as the extraction of Sulfur by the Claus method, it is obtained in molten form. On the other hand, it is easier for most consumers to use this material in molten form, and if it is possible to transfer this material in molten form from the source of production to the place of consumption, it will save the costs of solidification and remelting. It is as mentioned, due to technical and safety reasons, this possibility is not available most of the time, therefore, molten Sulfur is degassed after degassing for better storage and easier transportation, in order to preserve the quality of molten Sulfur, it is used in suitable forms as needed. Convert Like molded sheet Sulphur, granule, pastille, and flakes are different types of formed sulphur, which have been developed according to different applications of their production equipment [19].

To make a cup, the Sulfur obtained in the Sheberghan deSulfurization unit is solidified in the form of pasteurization by rotating machines, The work of this machine is to provide liquid droplets for freezing on steel belts using a closed loop in cold water circulation. The solid pastilles (hemispheres) are collected by a conveyor belt under which a water cooling system is located and transferred to the silo by a bucket elevator and a reversible conveyor belt. From the silos, the Sulfur pellets are loaded directly onto the trucks [20].

8. conclusion

The modified Claus method offers an effective solution for deSulfurizing natural gases in Sheberghan, greatly improving Sulfur recovery while reducing environmental pollution. This process converts hydrogen sulfide (H_2S), a toxic byproduct of natural gas extraction, into elemental Sulfur, a valuable industrial product. The Sheberghan gas fields, particularly Yatim Taq, Khwaja Gogerdak, Jorqaduq, and Shukrak, produce significant amounts of Sulfur-containing gas. Current sweetening units, while necessary for H_2S

separation, contribute to environmental issues through the combustion of sour gas, resulting in harmful Sulfur dioxide (SO_2) emissions.
By implementing the modified Claus process, approximately 99% Sulfur purity can be achieved, minimizing harmful H_2S emissions and recovering a typically wasted resource. Additionally, integrating advanced purification units and managing operational parameters effectively can enhance Sulfur recovery efficiency, ensuring compliance with environmental regulations while maximizing economic benefits. This underscores the importance of adopting such technologies for sustainable development in the petroleum and gas industry in the region.

Abbreviations

SRU	Sulfur recovery unit
WHB	Waste Heat Boiler
AGKOD	Acid Gas Knock Out Drum

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Authors Profile



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