

Gas Dehydration in Gas treatment unit of south Rumaila oil Field Using (Tri ethylien Glygol(TEG)

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Abstract—Knowing the meaning of gas dehydration and who consists of gas dehydration units. Knowledge of the dried substance for a gas. Knowledge of the operating conditions of the drying unit equipment.

I. INTRODUCTION

The Dehydration process is one of the most prominent field treatment processes that natural gas is subjected to in the areas of extraction, whether it is extracted Free from gas reservoirs or associated with crude oil extracted from oil reservoirs (the Dehydration process depends on the absorption of steam The water was extracted from the gas by the concentrated glycol in the Dehydration tower, and then the glycol was reactivated by evaporating the water absorbed by the Reboiler thermal and Still Colum .[1]

○ The purpose of the Dehydration process

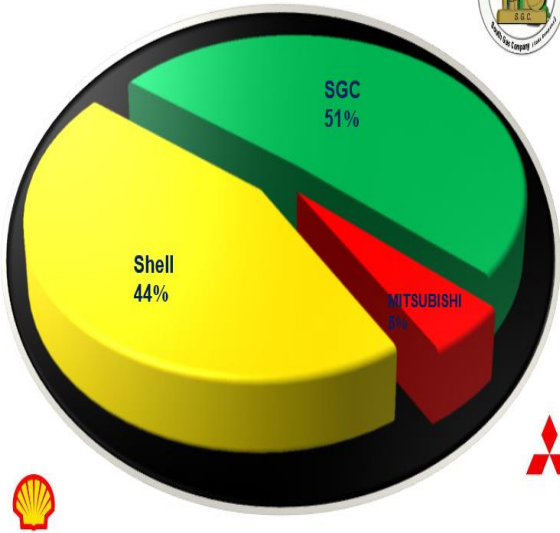
It is the removal of natural gas from its water content, which is in the form of steam at the saturation point, where the water content of the gas causes a number of problems.

Most notably:-

- Corrosion of pipes and equipment, especially in the presence of acid gases such as carbon dioxide and hydrogen sulfide.
- The formation of hydrates, which are solid crystals that result from the union of water molecules with some hydrocarbons and cause valves to clog and tubes .
Reducing the energy of the gas pipelines as a result of the condensation of water vapor and its transformation into a liquid that forms space in the pipes .

- gas sources
 - Natural Gas
 - It is an alternative energy source for oil from low cost, emission, environmentally polluting and fuel that is an important primary energy resource for the chemical industry.
 - -Natural gas is made up of plankton, microscopic organisms that include algae and primary organisms that have died and accumulated in the ocean and earth layers.
 - -The amount of energy free from combustion reflects the thermal value of gas.
 - accompanying gas

Associated with crude oil extracted from oil reservoirs.[3]



National gas system

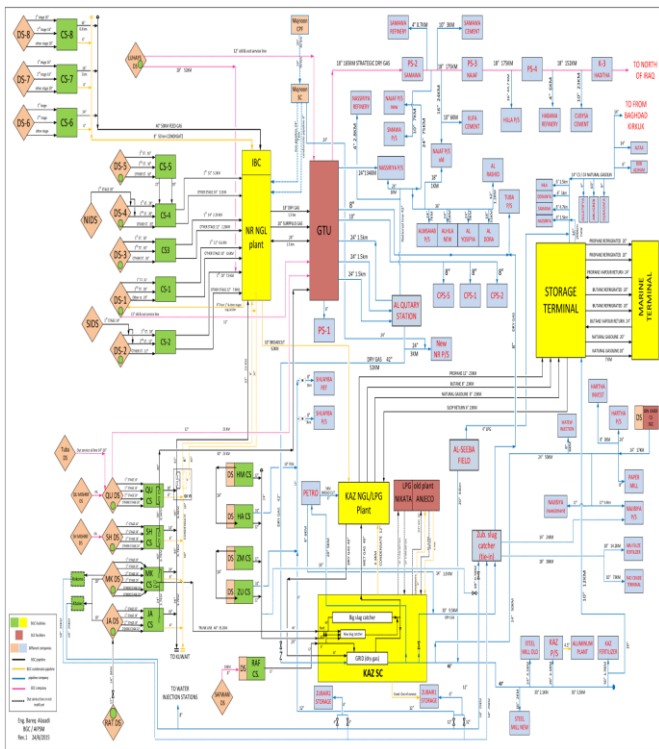


Figure 1 : National gas system

- Dehydration unit equipment
- Absorbtion Tower

It is a vertical tower containing from the inside nine trays for gas contact with claycool and the distance between each tray and another (26 in) bubble caps, these trays are semicircular to increase the area of contact between the gas and the claycol.

When the gas enters the tower and contacts with the claycol the latter absorbs water from the gas and dried it and the gas outside after passing in all trays contrary to the direction of the passage of claycol comes out the gas to the consumers and the purity of 99.9 % and there are two small tubes from which we take gas where the first tube is responsible for feeding the filter system and the second goes to a small insulator and its pressure is reduced by the regulator regulator. [1]



Figure 2: Absorbtion tower



Figure 3: Bubble cap

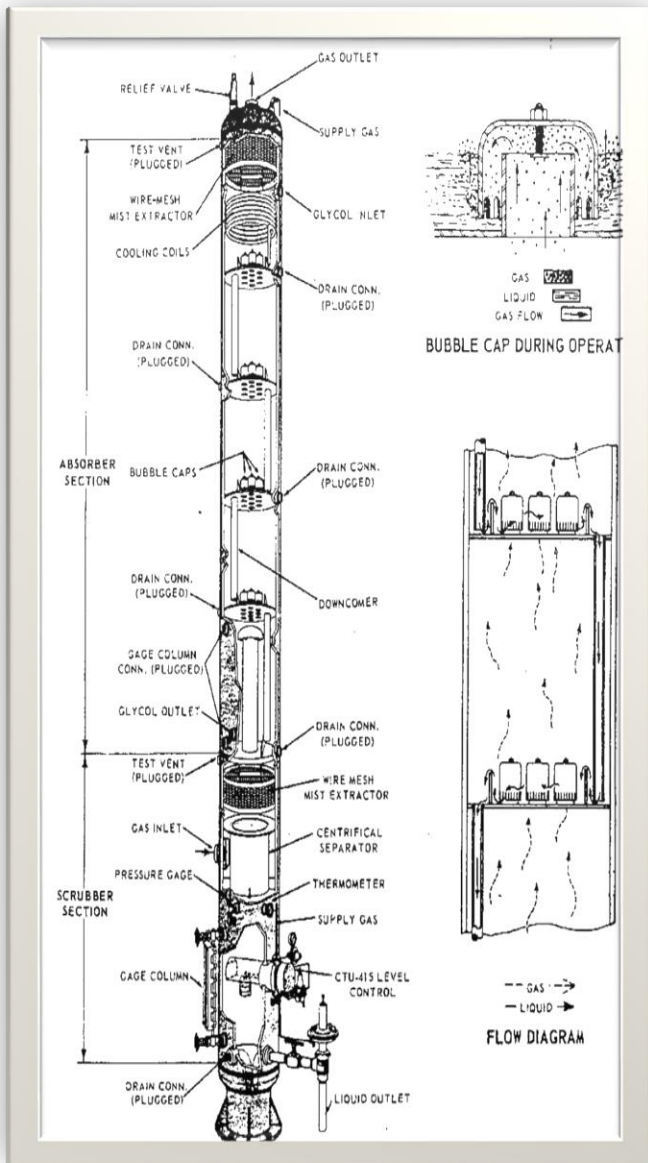


Figure 4: Absorbtion Tower

- Reboiler

It works to heat the glycol outside the distillation column to a temperature of 200 degrees Celsius. It consists of an outer wall in the form of a horizontal tank inside which there are parallel ring tubes that enter. It comes out from one side through which the gases resulting from the combustion of gas used as fuel pass. Inside there is a glycol descent column that extends for a distance of 60% of the height of the convector. This is to ensure that the glycol covers these tubes completely, and when the glycol level rises more than 60% inside the convector passes through the column to go down to the collection tank. [2]



FIGURE 5: REBOILER



Figure 5: Fire tube

- Down comer

It is a column that connects the reboiler to the collection tank and is the last stage of dry and hot that is passed from the bottom of this column for the purpose of extracting and separating the remainder of water vapor contained in the

glycol, as the gas exits from the top of this column to The convector carries water vapor with it and then comes out with the gases resulting from combustion Gaseous fuels, as the high temperature of the glycol coming down from the and high temperature dry gas used as extraction gas

Stripping Gas It works to release the water vapor present in the glycol and prevents the dissolution of the extraction gas in the glycol.[1]

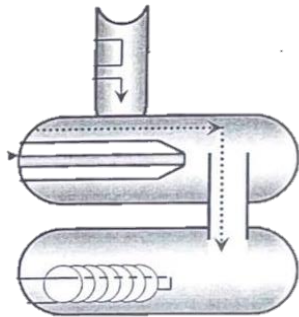


Figure 6: Down comer

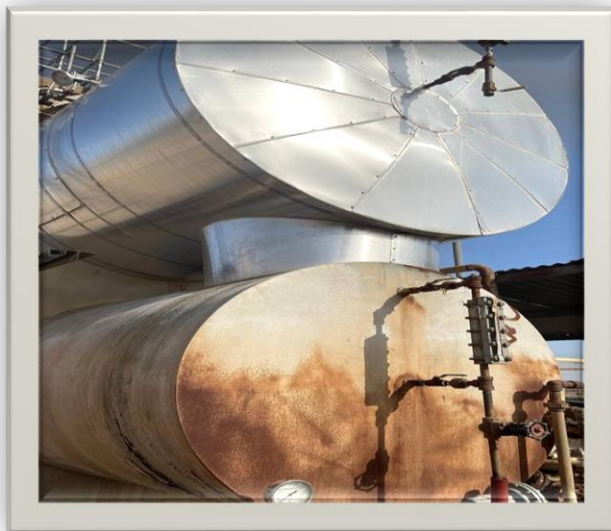


Figure 7: Down comer

○ Glycol Pump

It is a pump of the reciprocating type that works to withdraw the concentrated glycol from the collection tank and push it to the dehydration tower after passing the heat exchanger. The gas compressor station contains two pumps, where one is

working and the other is reserve. It has a constant flow and variable pressure with the change in the pressure of the tower where its pressure is slightly higher From tower pressure, this pump is also called suction pump.



Figure 8: Glycol Pump

○ Storage Tank

The reactivated glycol accumulates in it to a concentration of 99.7% and falls Under the reboiler and connected to it by the down comer.[2]



Figure 9: Storage Tank

- Still Column

It is a column of the type in which the filling is used Ceramic or trays and used with a Reboiler , where the fumes pass through The rise as a result of heating the saturated glycol in the heater and column function Condensing the glycol vapors back into the liquid and allowing the water vapors to escape int Atmosphere The hash column at the top includes a heat exchanger or coil The cold glycol saturated with water runs inside it to ensure temperature stability At the top of the column at 212 F (the boiling point of water) In addition, the hash column at the top of it contains a tube Annular in the form of a coil known as the reflex coil.

Triple running inside Cold water ethylene glycol and hydrocarbon condensate And the dissolved in it comes from the first-stage gas absorption tower and the two-stage gas dehydration tower The purpose of this file is to raise the glycol temperature and maintain Temperature stability inside the still colum plus condensation The remainder of the

evaporated glycol and ascended to the top of the still colum .[4]



Figure 10: Still Column

- Glycol Filter

It is used to rid glycol of impurities and suspended matter before entering the Reboiler during the glycol recycling process. The maximum permissible pressure on the filter is 1 kg , so it is necessary to replace the filters or clean them when the pressure difference is higher than the permissible limit.[6]



Figure 11: Glycol Filter

○ Heat Exchangers

It is by heating the glycol coming out of the reflex coil to a temperature of 160 Celsius through heat exchange with the concentrated glycol coming from the storage tank and at the same time cooling the concentrated glycol to a temperature of 60 Celsius before entering the Absorption tower. [5]

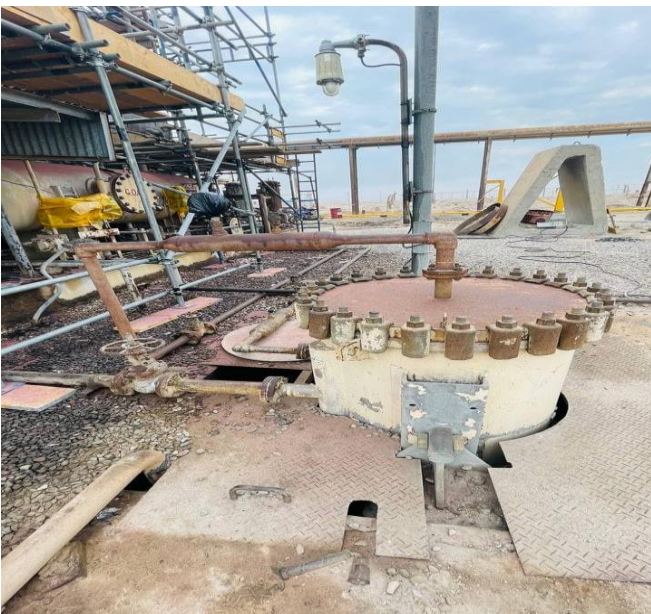


Figure 12: Heat Exchangers

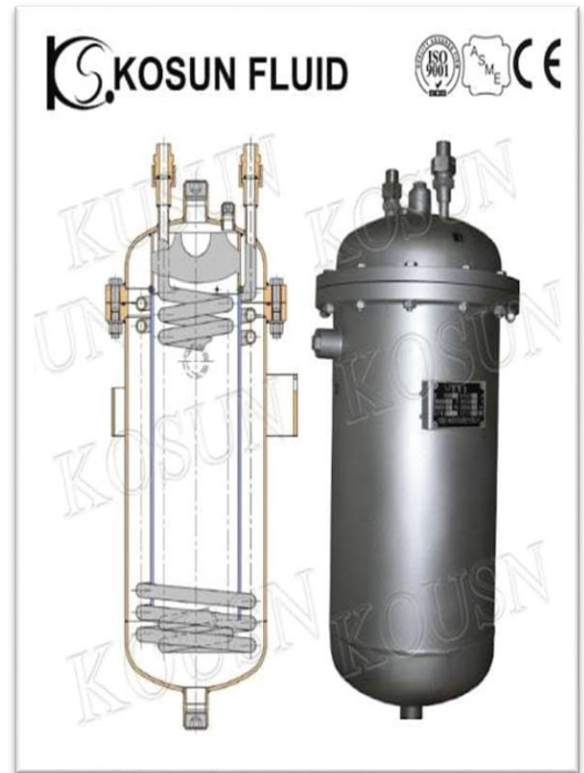


Figure 13: Heat Exchangers

○ G.O.G Glycol – Oil –Gas

It is a horizontal dielectric that isolates glycol, gas and condensate. The glycol and capacitors are sent to its section and there is a self-control valve to drain into the combustion chamber on top of this isolator there is a tube Gas is discharged to the reboiler in the form of fuel through a small buffer and the excess pressure and above goes through a regulator to Burning and there is a safety valve at the top of the isolator that opens when needed The principle of its work is to isolate the condensed hydrokaronic liquids in the dehydration tower from the glycol by overflowing the pressure less than the pressure of the tower.

Its operating pressure is 90, and the hydrocarbon liquids are drained to the burning chamber This buffer is equipped with a glycol level control valve and a condensate level control valve. When entering the glycol, it collides at the beginning with a small iron barrier to help spread the glycol and the pressure difference between the absorber tower . The insulator releases a large amount of gases and condensate and then the saturated glycol comes out to the reboiler.[1]



Figure 14: Glycol oil Separator(G.O.G)

- Description of the drying process by triethylene glycol

Wet gas enters from the bottom of the tower, while the concentrated glycol, driven by the pump, enters from the upper part. Through these cups and their mechanical movement up and down as a result of gas being pushed to them, as well as the presence of small holes that come out in the form of bubbles through the glycol and when these bubbles touch the surface of the hot glycol they explode releasing the dry gas while the water mixes with the glycol and so on for the second and third trays to the ninth tray.[3]

Where the water content is in a state of equilibrium, and from a scientific point of view, it is not possible to reach the state of theoretical equilibrium, as this requires a large number of trays, but it is possible to approach the state of equilibrium in the way that the water content of the gas is within the specifications required scientifically.

Thus, the gas from the top of the absorber tower by 99.7% to pass through the valve PCV turret pressure control valve And directing it to the laboratories as needed and work requirements.[4]

As for the glycol coming out of the absorber tower, it is loaded with water and directed to the activation unit to refocus it as it passes through Immediately after exiting the absorber tower, a buffer is used to separate hydrocarbon liquids GOG.[5]

that mixed with glycol As a result of contact with the gas in the absorber tower, then the glycol passes into a (Reflux coil). located inside still colum, as it acts as a condenser for the glycol vapors rising from the top of the column, due to its lower temperature from buffer GOG .

To obtain heat exchange that leads to a reduction in the loss of glycol and to obtain stability The temperature is at (122 F) at the top of the still colum.

Then the saturated glycol comes out of the heat exchanger. In this heat exchanger, a temperature is allocated The concentrated glycol that comes from the storage tank and goes to the pumps to maintain it and to obtain a temperature Suitable for concentrated glycol as well as raising the temperature of saturated glycol from (150F – 250F)

As for the concentrated glycol, its temperature decreases from (275-200 F), after which the saturated glycol tube passes through the collection tank to reduce the temperature The concentrated glycol then passes through the filters to get rid of impurities and suspended solids, and there are scales on it where it can be replaced Filter tubes after knowing the percentage of pollution, which is always the difference between them 20F.

And that this degree helps the adhesive materials and the remaining with the glycol To stay in the filter and go out where it pours into the still colum and raise its temperature there (370 F – 390 F) .

Where the water is evaporated and disposed Through the still colum heading to the open air, as for the glycol, when its level inside the reboiler rises to 60 % .

pass through descending stream (Down comer) where the glycol concentration is raised by extracting gas Stripping gas. In the storge tank where the temperature is reduced between the cold glycol that has gained heat (275 F), and then the glycol goes to The heat exchanger where it meets the cold as we mentioned earlier, and then it loses its temperature to (200 F), and then the pump is withdrawn, whose pressure is higher than the absorber tower gas pressure.[6]

Then it goes to the pump pressure heading to the cooling fans and that the self-control of the glycol temperature In fans by fins, where the glycol cooling fans consist of two fans to obtain a degree An appropriate temperature and an exchange between the concentrated glycol entering the tower passing through the external air cooler where Its temperature decreases as the temperature drops from (150 F - 100 F), and this temperature maintains it So that the glycol temperature

difference is going to the absorber tower to be poured into the top of the absorber tower.

The difference between the temperature of the gas entering the absorber tower and the temperature of the glycol center entering the absorber tower as well It should be less than (20 F), but the fuel gas for the reboiler is the same as the gas coming out of the insulator. (where the pipe passes inside the storage tank before going to the reboiler to raise its temperature to raise the efficiency reboiler.[7]

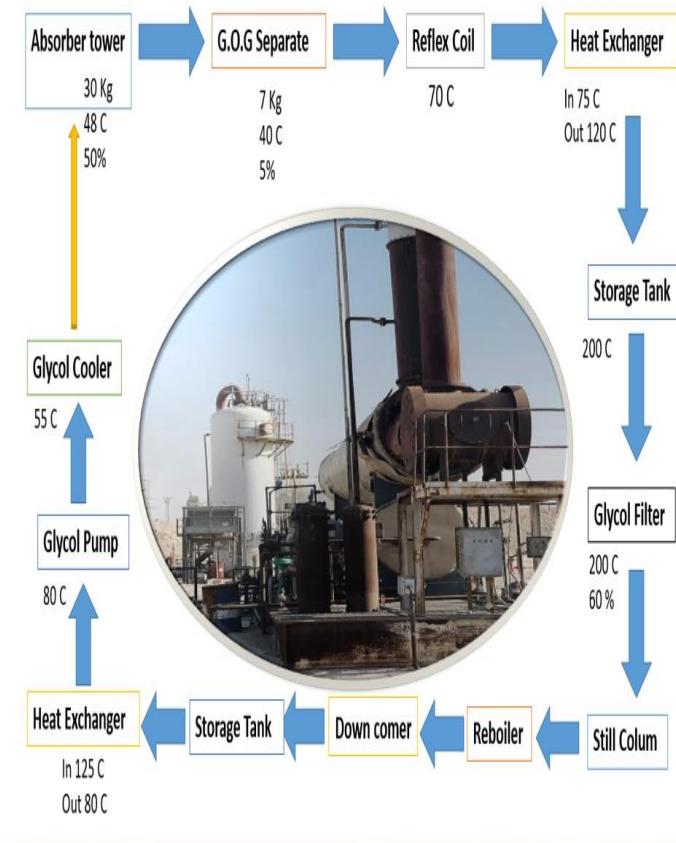


Figure 15: Gas Dehydration

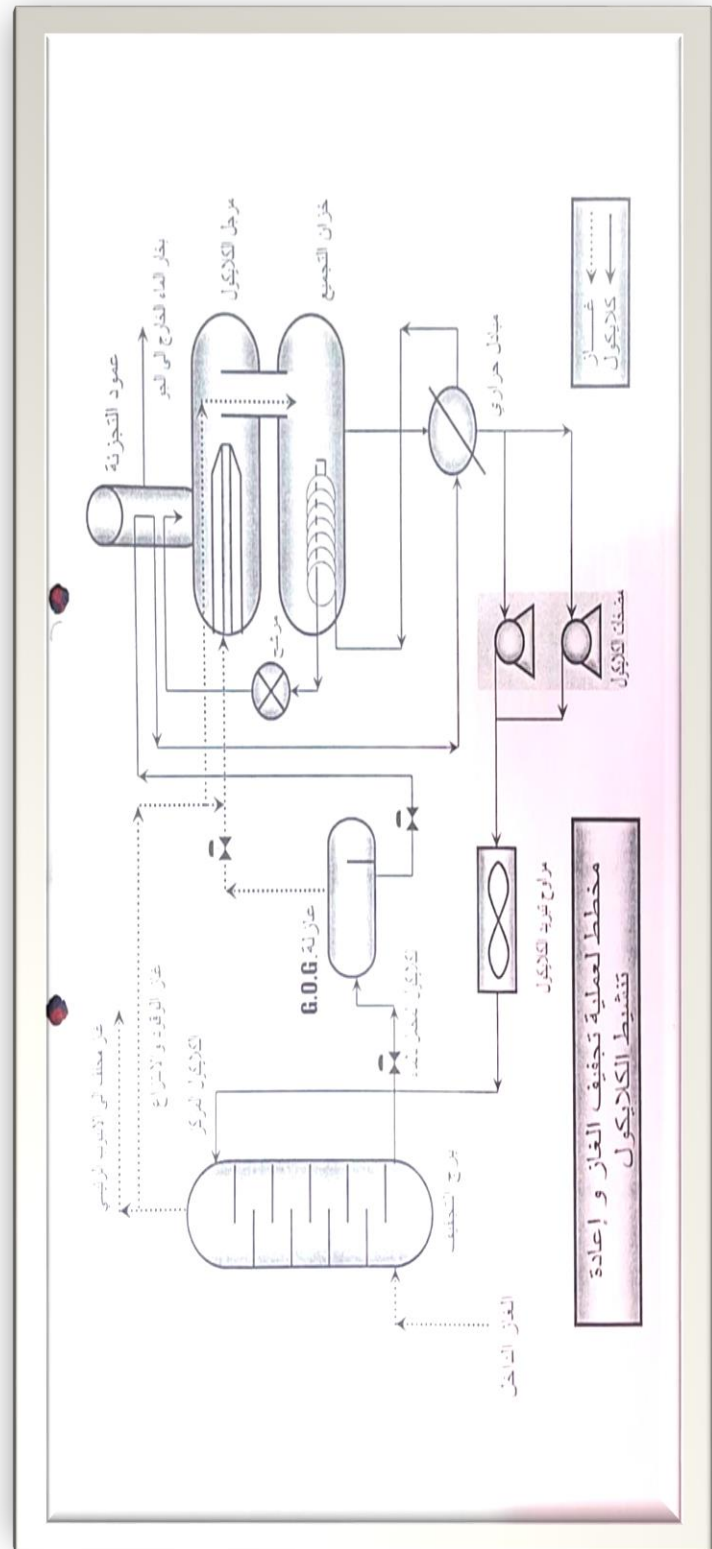


Figure 16: Description of the drying process by triethylene glycol

Table1. showing the operating conditions of gas drying cycle equipment

equipment	Operational conditions (pressure & temp & Level .)
Absorption Tower	(45-55 °C) (28.5-30Kg) (Level 50%)
Reboiler	(185- 200 °C) (Level 60 %)
Storage Tank	(Level 10-60%) (195°C)
Still Column	(90-95°C)
Glycol Pump	(75-90°C) (>1Kg Absorption Tower)
Hot Exchangers	(in cold 85°C & out cold 120°C) (in hot 148°C & out hot 93°C)
G.O.G Glycol – Oil -Gas	(100 psi) (45 – 50 °C) (Level 5-15%)

REFERENCES

- [1] Training and Development Department of Basra Gas Company.
- [2] Head of the South Rumaila Production Division, Professor Shaker Al-Zuhairi.
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- [4] <https://www.youtube.com/watch?v=NNW1gZ2yOrQ>.
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