Q.B. JOHNSON
MANUFACTURING, INC.

A LEADER IN GAS CONDITIONING TECHNOLOGY

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GAS TREATING

Gas treating / gas sweetening is a term used to describe the various processes for removal of naturally occurring carbon dioxide (CO_2) and hydrogen sulfide (H_2S) from natural gas and / or hydrocarbon liquids; CO_2 and H_2S are the most common contaminants found in natural gas. These impurities are also termed as “acid gas” because they form an acidic solution when absorbed in water.

There are several reasons to remove CO_2 and H_2S from natural gas; these impurities are toxic, highly corrosive to equipment, have the ability to cause the formation of hydrate solids in pipelines, and reduce the overall BTU value of gas. The primary method for removing CO_2 and H_2S from natural gas streams is via the use of an amine treating unit.

Amine has a natural affinity to remove both CO_2 and H_2S from natural gas, making the gas suitable for transportation and use. In addition to removing CO_2 and H_2S, sulfur acids such as carbonyl sulfide (COS), carbon disulfide (CS_2), and the mercaptan family (RSH), when present in sufficient quantities, are also candidates for removal with specific amines.

Typical Gas Pipeline Specifications:

Hydrogen Sulfide (H_2S)	0.25 grain/100 scf or 4 ppm
Carbon Dioxide (CO_2)	2-3 mol% (5% inerts)
Carbon Disulfide (CS_2) Carbonyl Sulfide (COS) Mercaptan (RSH)	20 grains/100 scf

TYPES OF ALKANOLAMINES AND PHYSICAL SOLVENTS

Solvents remove acid gas by straight absorption or a combination of absorption and chemical reaction. Amines can be categorized on a chemical basis as being primary (MEA or DGA), secondary (DEA or DIPA), and tertiary (MDEA or TEA) depending on the number of substitutions onto a central Nitrogen element.

The chemical structure influences each amines’ properties as a treating solvent, and therefore, lends themselves to different applications. The following is a list of conditions or considerations that must be defined when selecting a treating solvent:

- Operating pressure and temperature
- Composition of acid gas and quantity to be removed, selectivity, and / or treated gas specifications
- Disposal of acid gases (reinjection, CO_2 recapture, sulfur recovery, or incineration)
- Contaminants in the inlet gas (oxygen, RSH, other sulfur compounds, free liquids, and high BTU gas)
- Environmental concerns (allowable ambient CO_2 / SO_2 emissions)
- Customer preference (capital costs, operating costs, fuel efficiency, chemical costs, and / or other operational issues)

Q.B. JOHNSON AMINE PLANTS


40 GPM Amine Unit
Location: Stuart, Oklahoma


150 GPM Amine Unit
Location: McCalester, Oklahoma

AMINE TREATING PROCESS

Q.B. Johnson Manufacturing, Inc. designs and manufactures amine units to be effective and efficient by utilizing proven technology and conservative designs. Since 1962, QBJ has established a reputation for engineering natural gas conditioning equipment. In addition, QBJ has had continuous experience in sweetening sour gas since 1981.

The following is a step-by-step explanation that demonstrates how amine units remove unwanted contaminants from natural gas.

1. Inlet gas enters the contactor and flows upward through the descending amine solution.
2. The treated / sweetened gas flows out the top of the contactor.
3. The rich amine solution, saturated with acid gas, exits the contactor via level controller to the flash separator.
4. From the flash separator, the rich amine enters the lean/rich heat exchanger and is heated via cross exchange with hot lean amine.
5. The rich amine enters the still column where steam from the regenerator strips the acid gas and regenerates the amine.
6. The steam/acid gas flows from the still to the reflux condenser where it is cooled, and the steam is condensed.
7. The condensed steam is separated in the reflux accumulator. The separated water is refluxed back to the still column. Acid gas exits the unit via pressure control valve.
8. The hot lean amine is further cooled by a solution cooler and is then circulated back to the contactor.
9. The regeneration heat source may be steam, hot oil, or a direct fired system.

Q.B. Johnson has experience with a variety of amines along with the metallurgical and process requirements unique to each solvent. QBJ has the experience and design capabilities to engineer and manufacture new amine treaters from 3 GPM up to and including 600 GPM units. All units are designed and manufactured on site at QBJ's 40,000 square foot manufacturing facility located in Oklahoma City, Oklahoma. Q.B. Johnson's manufacturing facility is furnished with the equipment to accomplish the task without the need to subcontract the basic components.

Q. B. Johnson Manufacturing can design, engineer, and manufacture gas treating facilities for most applications. QBJ has assumed responsibility for several gas treating projects and has successfully provided units for natural gas field installations, refinery tail gas sweetening applications, liquefied ethane treating, raw NGL treating, and other applications. Please contact Q.B. Johnson with your acid gas removal application.

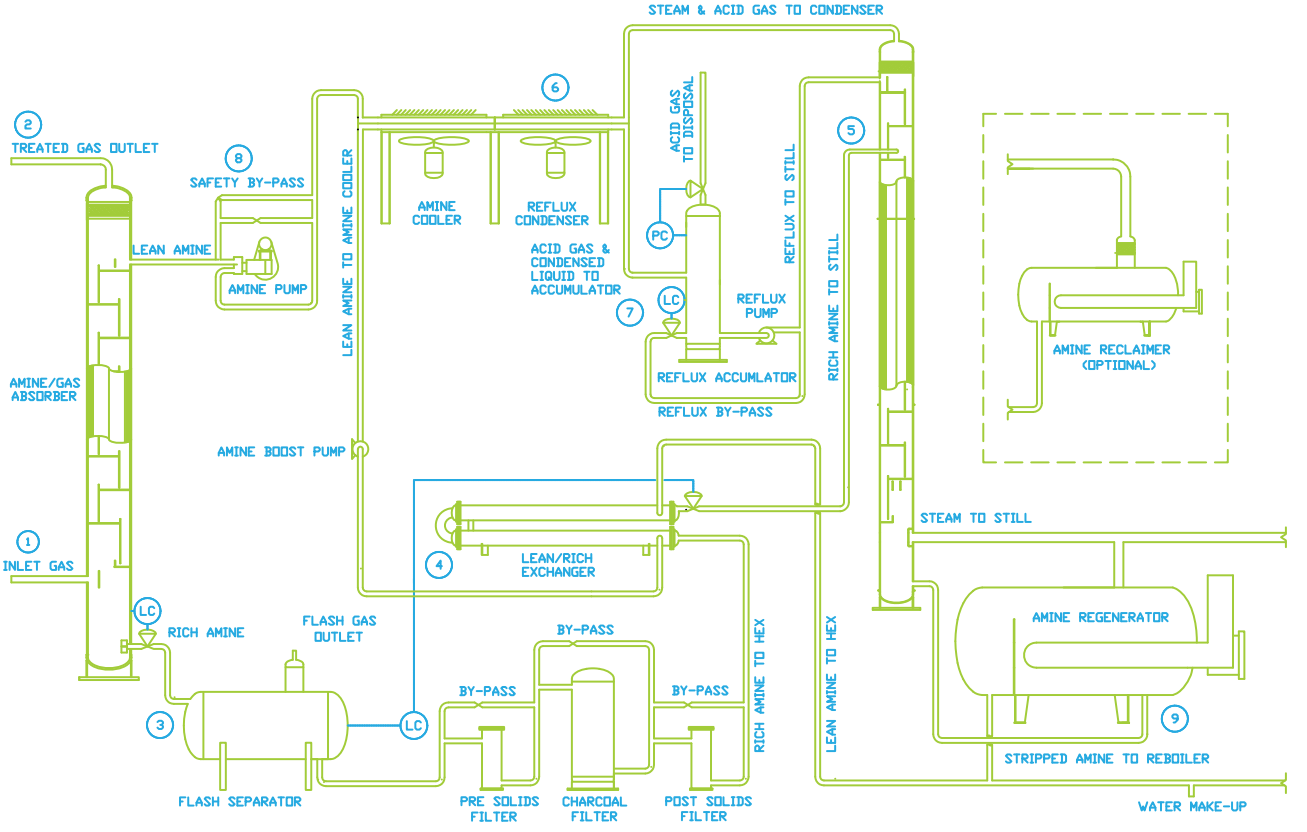

FIGURE 1. SIMPLIFIED AMINE SYSTEMS FLOW DIAGRAM

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