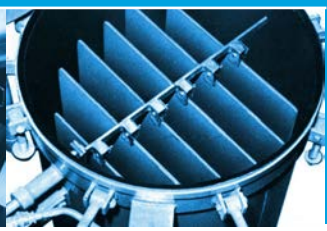
AMINE FILTRATION

Passion







for Filtration

TWIN FILTER®

OVERVIEW

Gas Treating or Sweetening is a term used to describe the various processes for the removal of certain contaminants, primarily hydrogen sulphide (H2S) and carbon dioxide (CO2) from natural gas or hydrocarbon liquids. CO2 and H2S are also named “acid gases” because when absorbed in water, they form an acidic solution. Reasons to remove these contaminants include toxicity, corrosiveness, freezing problems, and to increase problems, and to increase the overall heating value of the natural gas.

Alkonalamine solvents are widely used to remove CO2 and H2S from gas and lighter hydrocarbon products. Amine has a natural affinity for both CO2 and H2S, allowing this to be a very efficient and effective removal process.

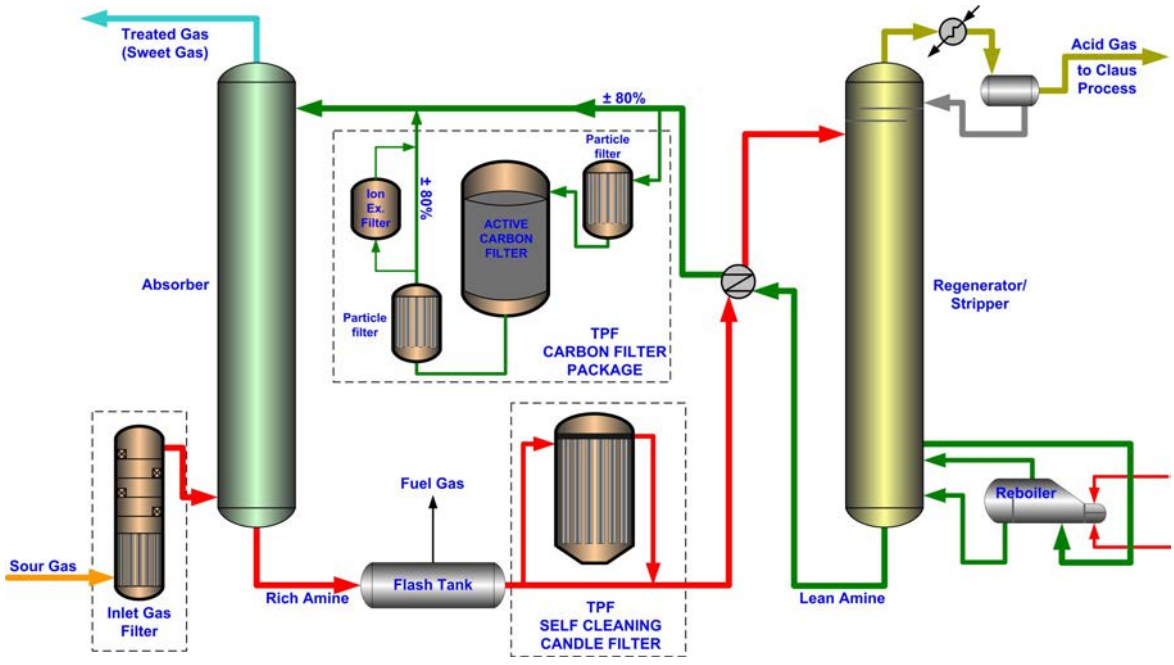
Crude oil with low sulphur content is becoming less prevalent and is costly on the market, while on the other side environmental regulations concerning H2S and CO2 content in light hydrocarbon products (fuels) are becoming more stringent. Many processes for the removal of acid gases have been employed commercially and various amines are used, each of the amines offers distinct advantages to specific treating problems.

Depending on the required selectivity, CO2 or H2S removal, various solutions of solvent can be used.
The most popular ones are:

- MEA / DGA;
- MDEA / DIPA;
- DEA.

PROCESS DESCRIPTION

- Sour Gas passes through an inlet separator and/or a gas- liquid filter/coalescer to remove the majority of hydrocarbons and solids.
- Sour Gas flows through the absorber tower and rises through the descending amine.
- Purified gas flows from the top of the tower.
- The amine solution is now considered Rich and is carrying absorbed acid gases.
- Rich amine is heated in the regeneration column. The steam rising through the regeneration H2S and CO2, regenerates the amine.
- Steam and acid gases separated from the Rich amine are condensed and cooled.
- The condensed water is separated in the reflux accumulator and returned to the still.



BENEFITS OF THE REMOVAL OF CONTAMINANTS

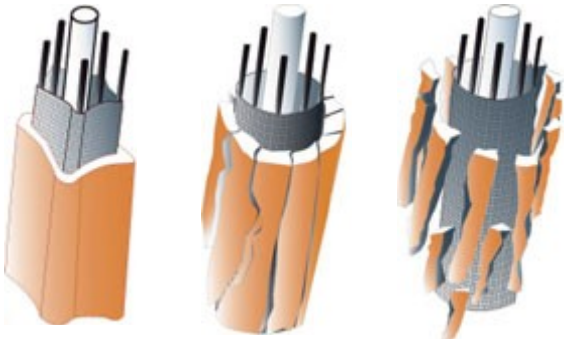
Installation of a good filtration system has become one of the key components of amine system design. The cleaner the amine, the better the amine system operates. Filtration has proven to be the most effective system for the removal of the contaminants such as solids, liquid hydrocarbons and heat stable salts. The removal of contaminants provides the following benefits:

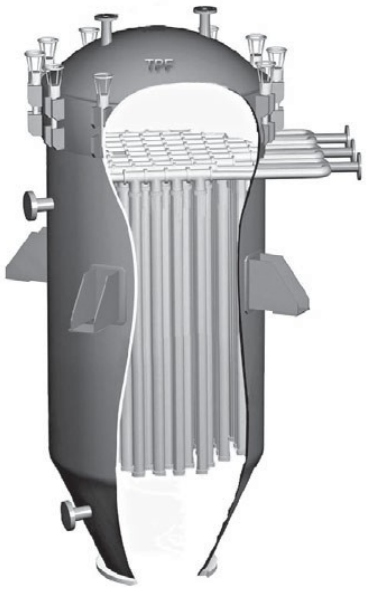
- Prevention of amine foaming;
- Reduced corrosion problems;
- Reduced fouling problems in the process;
- Increased life time of Carbon Bed;
- Reduced amine consumption;
- Maintaining Amine efficiency and plant capacity.

TWIN FILTER SOLUTION FOR THE AMINE FILTRATION

The amine cleaning includes a three step filtration system:

- Gas inlet filter;
- Mechanical pre-coat type filter;
- Activated carbon filter and cartridge filters.





GAS INLET FILTERS

The first filter section is the gas inlet filter. Here the liquid hydrocarbons and solids that can upset the plant operations are being removed. Mist eliminators, filter vanes or coalescing filters can be used for this process. A combination of various techniques in series is the optimum to remove all levels of particles and liquids.

MECHANICAL PRE-COAT TYPE FILTER

When the amine system is extremely contaminated, filtration of the rich amine may be required. It prevents the heat exchanger from plugging and the concern that FeS in the Rich amine can dissociate in the regenerator under certain conditions to soluble iron compounds. These will not be removed with the filtration of the Lean amine.

In order to prevent filter cloth from clogging and to secure fine filtration efficiency, the concept of pre-coat filtration is used. Filter elements are protected by depositing a layer of pre-coat material on their surface, prior to filtration. In order to obtain a layer of pre-coat material, liquid with pre-coat material is introduced into the filter vessel, filtered and returned to the pre-coat tank. The pre-coat solution is prepared by mixing uniformly a part of the inlet Lean amine solution with the pre-coat material, which can be cellulose or diatomaceous earth. The proper selection of the pre-coat media is a key factor for successful operation and performance achievement of the filtration unit.

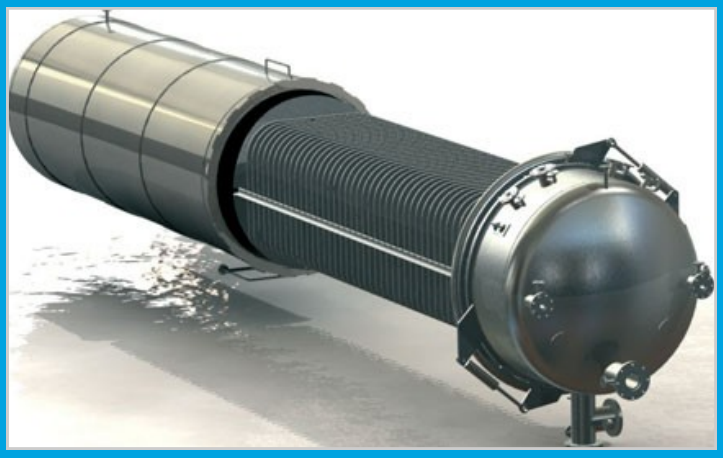
Depending on the clients' specific requirements, Twin Filter offers two types of mechanical pre-coat filters, to remove solid particles from the solution:

SELF CLEANING CANDLE FILTER

The Self Cleaning Candle Filter consists of a vertical cylindrical vessel with a conical bottom. The candles are vertically positioned in horizontal collecting manifolds. The filter candles are covered with a filter cloth. Once the filtrate has passed through the filter cloth, it flows into the peripheral tubes down to the bottom of the candle, before rising again in the central tube toward the registers. When the filtration cycle is completed, cake discharge is brought about by counter-current gas pressure in the interior of the candle. The quick-pulse gas blow-back lifts the filter cloth from the support candle and the filter cake releases, causing it to fall.

SELF CLEANING VERTICAL LEAF FILTER

Pressure leaf filters are horizontally positioned vessels holding vertically positioned filter leafs. The filter leafs are covered with a SS mesh retaining the filter aids on the surface. Once the filtrate has passed through the filter leaf bundle, it flows into the central manifold through the filtrate outlet. For cake removal the filter is being opened and the filter leafs are being cleaned by means of a pneumatic vibrator, the filter leafs being fully exposed and the semi-dry or dry cake is discharged without obstruction.



ACTIVATED CARBON FILTERS AND CARTRIDGE FILTERS

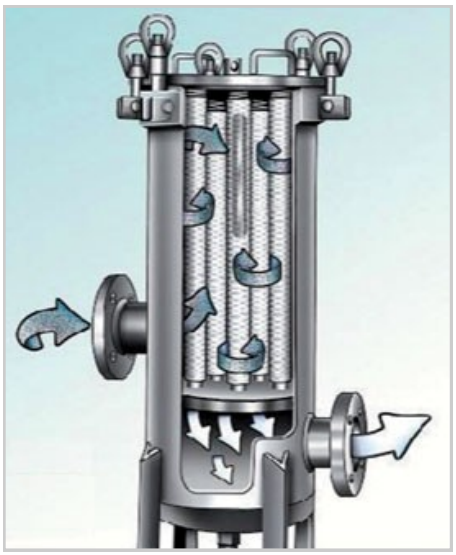
Because the Rich amine solution is heavily loaded with acid gas, it can form gas pockets in the carbon filter resulting in a reduced or completely blocked flow. In terms of safety for the workers who dismantle, inspect and clean-out the filters, it is safer to install the carbon filters in the Lean amine stream. Carbon filtration removes surface active contaminants, hydrocarbons corrosion inhibitors, amines degradation products, oils and reduces the tendency of the amine solution in the stripper to foam.

At the inlet side of the carbon filter, a cartridge filter is installed preventing particles from blocking the activated carbon. All of this results in a reduction of operational- and maintenance costs. To reduce the running costs, a self cleaning candle filter can be installed on the inlet side. At the outlet of the carbon filter a cartridge guard filter is installed to prevent carbon fines to enter the amine circuit.

Filtration requirements depend on the micron size and the quantity of the particulates. Generally, 5-10 micron size filters are used suitable for particulate removal. Particulates in the circulating solution should be kept below 0.02 wt%. The filter should be equipped with a differential pressure gauge to monitor removal effectiveness and be able to operate up to pressure differentials of 2- 2,5 bar (g). Above this, the filter elements could collapse and become ineffective.

The life of a carbon filter will vary depending on the level of contaminants and the flow rate of the amine through the bed. A typical life may be 4 to 6 months, although in some cases beds have lasted for many months longer than that. In determining when a carbon bed should be changed, the following criteria can be used as a guide:

- High pressure drop across the carbon bed;
- An increase in foaming tendency;
- A colour comparison of the amine solution which has passed a fresh and an old carbon bed.



DESIGN DATA

Gasses and liquids containing hydrogen sulphides can be the cause of costly corrosion problems in process equipment. Even at low concentrations hydrogen attacks can lead to cracks and various types of corrosion which leads to unexpected premature failures, endangering operators and environment. To avoid such problems material selection and material treatment is of utmost importance. Steel materials can be applied provided that they meet the requirements and quality defined in the NACE MR 0175 guidelines. Post Weld Heat Treatment (PWHT) is applied and this will reduce the hardness (Vickers) and cracking failure.

DESIGN

All equipment is designed according ASME VIII and will be supplied with or without “U”- Stamp. PWHT is included. Design pressures can be up to 150 bar and temperature ranging down to -40ºC.

CONNECTIONS

Standard ANSI RFWN.

MATERIALS

Materials of construction applied in Gas Sweetening plants is mainly carbon steel. NACE guidelines apply. But alternative materials are available; a selection of Stainless Steel or special alloys on request.

OPTIONAL

Optional equipment as High Pressure Quick Closures, skid mounting, inter-connecting piping can be applied.

ABOUT THE PROCESS DIVISION

The Process Division is a part of Twin Filter BV. Twin Filter BV is an originally Dutch Company founded in 1985. The Process Division is providing solid/liquid separation and gas filtration solutions and services for a variety of industries worldwide.

The Process Division brings together the knowledge of filter media, filtration technology and outstanding skills in mechanical engineering, making hardware and software successfully work together.

Costumers can count on professional advice and support from all-rounders in filtration technology, offering effective, efficient and durable solutions that will prove themselves in the long term.

WHY FILTRATION?

Continuity demands a forward-looking approach, anticipating technological developments, new demands and new possibilities. New environmental regulations, improving productivity and recovering valuable resources are challenges for the Research and Development department.

In all sectors, the requirements are becoming increasingly stringent. Our quality system keeps pace with these developments. We have one common goal: to find solutions that will improve the quality of your product and improve your production process; thereby increasing the profits of your company.

APPLICATIONS

- Liquid Sulphur
- Sulphuric Acid
- Mining
- Titan Oxide
- Caustic / Brine
- Catalyst Recovery
- Activated Carbon
- Food and Beverage
- Vegetable Oils
- Waste Water Treatment
- Pharmaceutical industry
- Petrochemical industry

AGENT, DISTRIBUTOR

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