

HCL GAS GENERATION PLANT

Introduction

Commercial Hydrochloric acid is available in the market as 30% aqueous solution and is widely used in industry in large quantities. However for certain applications, such as hydrogenation reactions, and in bulk drug/ pharmaceutical industry, HCl is required in gaseous form.

HCl gas is required in anhydrous state for critical reactions where moisture cannot be tolerated. In such cases HCl Gas can be generated from commercial grade HCl acid, through several different methods.

HCl Gas Generation by Ablaze

Ablaze has a long and successful record of design and supply of several Engineered systems for HCl gas generation. Being manufacturer of Borosilicate glass equipment, PTFE components and PTFE lined components, Ablaze is well qualified to handle such systems, as these are the major Material of Construction used in such systems. Ablaze also has in-house capabilities for Instrumentation and Automation, which is necessary for reliable and safe operation.

Different processes for HCl gas generation are offered based on customer requirement:

- Using Calcium Chloride
- Using Concentrated Sulfuric Acid
- Distillation or Boiling process

Ablaze can successfully design and supply HCl Gas Generation plants from 5 Kg/Hr up to 250 Kg/Hr capacity.

Larger capacity plants can also be provided on request



HCl Gas Generation by CaCl₂ Process

HCl gas generation by Calcium Chloride route is the most environment friendly technique, with nil effluents. Hydrochloric acid and water form a maximum boiling point azeotrope at 110°C corresponding to a concentration of 20.2% (w/w) HCl. If concentrated CaCl2 solution is added co-currently to this, the azeotrope point is eliminated, and the entire HCl becomes available for liberation by distillation.

30% HCl solution is fed to the distillation column, after being pre-heated in a heat exchanger. Simultaneously a co-current feed of concentrated calcium chloride is also added to the distillation column. The released HCl gas vapours leave from the top and are condensed stage-wise with cooling water and chilled brine. The gas can be further passed through a mist eliminator to remove all traces of moisture, using a suitable dehydrating agent, and then taken to the point of consumption. The moisture content of final product HCl gas is expected to be less than 0.01%.

The effluent moves from the bottom of the column and is dilute calcium chloride solution with some HCl. It is concentrated to 50% in evaporator and re-used.

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Typical flow scheme for HCl Gas Generation by CaCl₂ Process

Salient Features

- Nil Effluent
- Zero Discharge
- Lowest operating cost
- Higher efficiency of process

Raw Material and Utility Requirements:

The indicative requirements for 20 Kg/hr HCl Gas Generation System are given below:

30% HCl feed: 65 Kg/hr Cooling Water at 30°C 4m3/hr Chilled Brine at -10°C 3m3/hr



HCl Gas Generation by Boiling Process

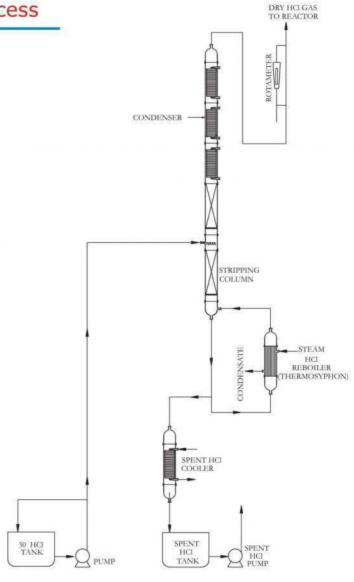
In this process, HCl gas is generated by the process of distillation of 30% Hydrochloric acid solution. Metered quantity of commercial hydrochloric acid is preheated in a preheater by steam and fed to a fractionating column with steam as heating media in the reboiler.

The vapours leaving the column are condensed with coolant as cooling water and chilled brine in stages. The relatively dry gas passes through a mist eliminator and then through a rotameter. The spent acid containing 22% HCL is cooled through a cooler and then discharged.

The system turn-down ratio is high and all the wetted parts of the system are made of highly corrosion resistant materials (Borosilicate 3.3 glass and PTFE).

Salient Features

- Low Capital Cost
- Low operating cost
- Compact and simple process
- No requirement of other feed chemicals
- Effluent is pure Hcl
- High efficiency (~99%)



Typical flow scheme for HCl Gas Generation by Boiling Process

Raw Material and Utility Requirements

The indicative requirements for 20 Kg/hr HCl Gas Generation System are given below:

30% HCl feed: 200 Kg/hr Cooling Water 3.5m3/hr Chilled Brine at -10°C 4m3/hr



HCl Gas Generation by Sulphuric Acid Process

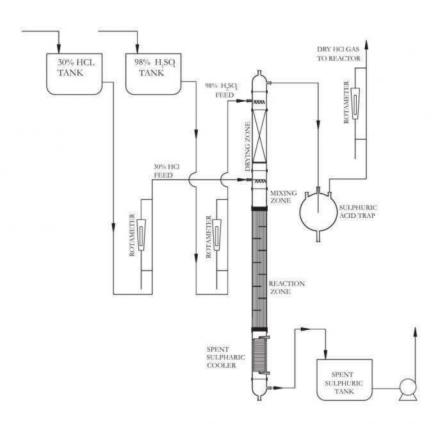
The process of HCl gas generation using Sulfuric Acid is quite similar to the Calcium Chloride method. Sulfuric Acid has a huge affinity towards water and hence acts as a dehydrating agent, thus removing water from the HCl solution.

The plant operates on continuous basis and 30% Hydrochloric acid solution (feed) is fed co-currently with concentrated (98%) Sulfuric Acid from the top of a packed column, in the Mixing Zone. Sulfuric acid comes in contact with water and produces heat which strips out the HCL gas. HCl gas is cooled in the heat exchanger to decrease the moisture content. It is then passed through Drying Zone to further remove the water through contact with Sulfuric acid and is finally passed through Sulfuric acid trap to make it anhydrous.

The dry product gas is measured through a rotameter and taken to a process or storage. The bottom product (spent acid) contains dilute sulfuric acid with some dissolved HCl. It is cooled in the spent acid cooler and taken to the spent acid storage tank.

Salient Features

- Low Capital Cost
- No need of separate mist eliminator
- Compact and simple process
- High efficiency (~99%)



Typical flow scheme for HCl Gas Generation by Sulphuric Acid Process

Raw Material and Utility Requirements

The indicative requirements for 20 Kg/hr HCl Gas Generation System are given below:

30% HCl feed: 70 Kg/hr 98% H2SO4 170Kg/hr

Cooling Water at 30°C 2m3/hr

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