

TECHNICAL PACKAGES

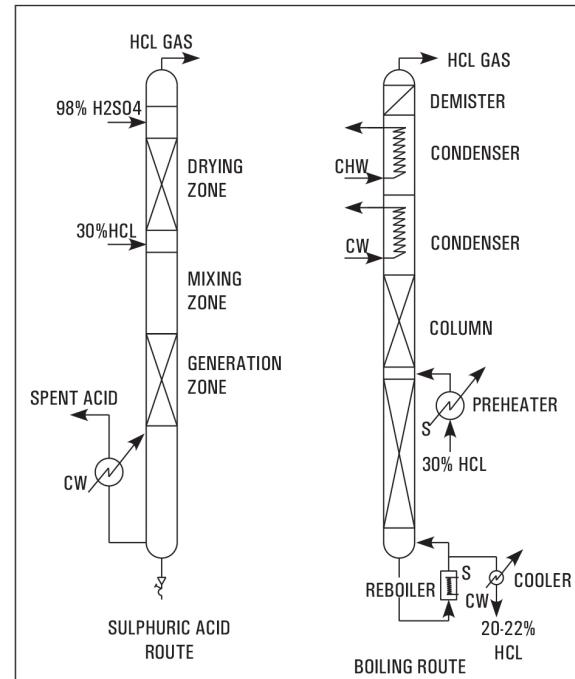
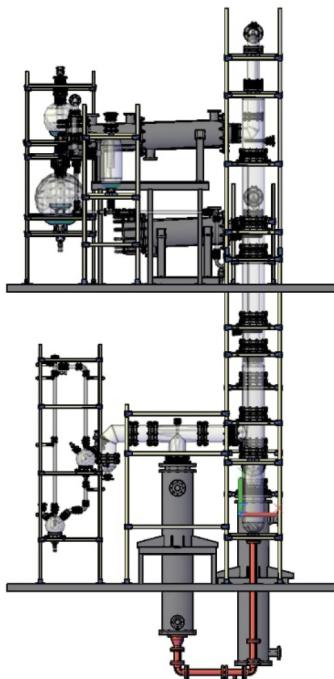
ANHYDROUS HCL GAS GENERATOR

Commercial Hydrochloric Acid is available in the market as 30% aqueous solution. But for certain applications e.g. bulk drug and pharmaceuticals, HCl is required in anhydrous state for critical reactions where moisture cannot be tolerated. Such users generate anhydrous HCl from commercial grade for their captive consumption.

METHOD

Several methods have been adopted by industries. But generation by Sulphuric Acid Route and Boiling Route are commonly practiced.

We offer Calcium Chloride Route also.



| Route | Sulphuric Acid Route | Boiling Route |
|--|---|--|
| Working Principle | Hydrochloric acid is highly soluble in water but the solubility diminishes in presence of H ₂ SO ₄ and at 70 to 75% H ₂ SO ₄ concentration its solubility is negligible. Thus by adding (98%) commercial Sulphuric acid to commercial hydrochloric acid (30%) in proper ratio the entire HCl can be liberated in gaseous form leaving 75% H ₂ SO ₄ as spent acid. | Aqueous hydrochloric acid forms a maximum boiling point azeotrope at 110°C containing 20.24% HCl at atmospheric pressure. Thus by distilling commercial hydrochloric acid (30%) pure HCl gas can be generated and spent acid will contain over 20.24% HCl. |
| Process Outline | Metered quantities of commercial sulphuric acid hydrochloric acids are fed to the unit where they mix in the Mixing Zone. The gas generated forms a froth and enters the Generation Zone where while traveling through a bed gas is released which travels upwards through the Drying Zone. Here the gas comes in intimate contact with downward flow of 98% H ₂ SO ₄ . The dry gas leaving the unit passes through a rotameter. The spent liquor containing 70-75% H ₂ SO ₄ passes through the Cooling Zone before being discharged. | 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. |
| Salient Features | <ul style="list-style-type: none"> - Operational reliability the unit can be started/ stopped in seconds. - Available in wide range of capacities from 5 to 200 kg/hr of dry HCl. - Except cooling water no other utility e.g. steam chilled water etc. required. - Anhydrous gas. - Capable of operating from 25 to 120%. - Ease of installation. - Negligible pressure drop. - High efficiency 99%. | <ul style="list-style-type: none"> - Operational reliability. - Available in wide range capacities from 5 kg/hr to 200 kg/hr of dry HCl. - Except commercial hydrochloric acid, no other raw-material is required. - Anhydrous gas. - Capable of operating from 25-100%. - Ease of installation. - Negligible pressure drop. |
| Indicative Raw-material & Utilities for 20 kg/hr HCl | 30% HCl - 70 kg/hr 98% H ₂ SO ₄ - 170 kg/hr Cooling Water - 2 m ³ /hr | 30% HCl - 200 Kg/hr Saturated Steam - 50 kg/hr Cooling Water - 3.5 m ³ /hr Chilled Brine - 4 m ³ /hr |



commercial 140 and 502 CellSolutions is a suspending culture which translates to a hollow bottom. The effluent from the bottom of the culture is acidic because it contains a solution which is concentrated to 50% in a salt-free medium. The supernatant is discarded and the wastewater is collected from the bottom. The wastewater then passes through a series of and then through a membrane filter to the point of discharge point.

Same material as [Typographic](#) framework

Final order of the replicants for 30 days of C. elegans culture are given in Table 1.

| 1. | 33-35 例題の解説 | 解説 |
|----|-------------|----|
| 2. | 36-38 例題の解説 | 解説 |
| 3. | 39-41 例題の解説 | 解説 |
| 4. | 42-44 例題の解説 | 解説 |

| 1990 | 1991 | 1992 |
|----------------------|---------------------------|--------------|
| II - MUSICAL | II - SCENIC DESIGN | III - COMEDY |
| II - DRAMA | III - PRODUCTION | III - DRAMA |
| II - DRAMAS | III - PROD. DRAMATIC | III - COMEDY |
| III - MUSICAL DRAMAS | III - DRAMATIC PRODUCTION | IV - DRAMAT |