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Service Process Equipment, Inc.

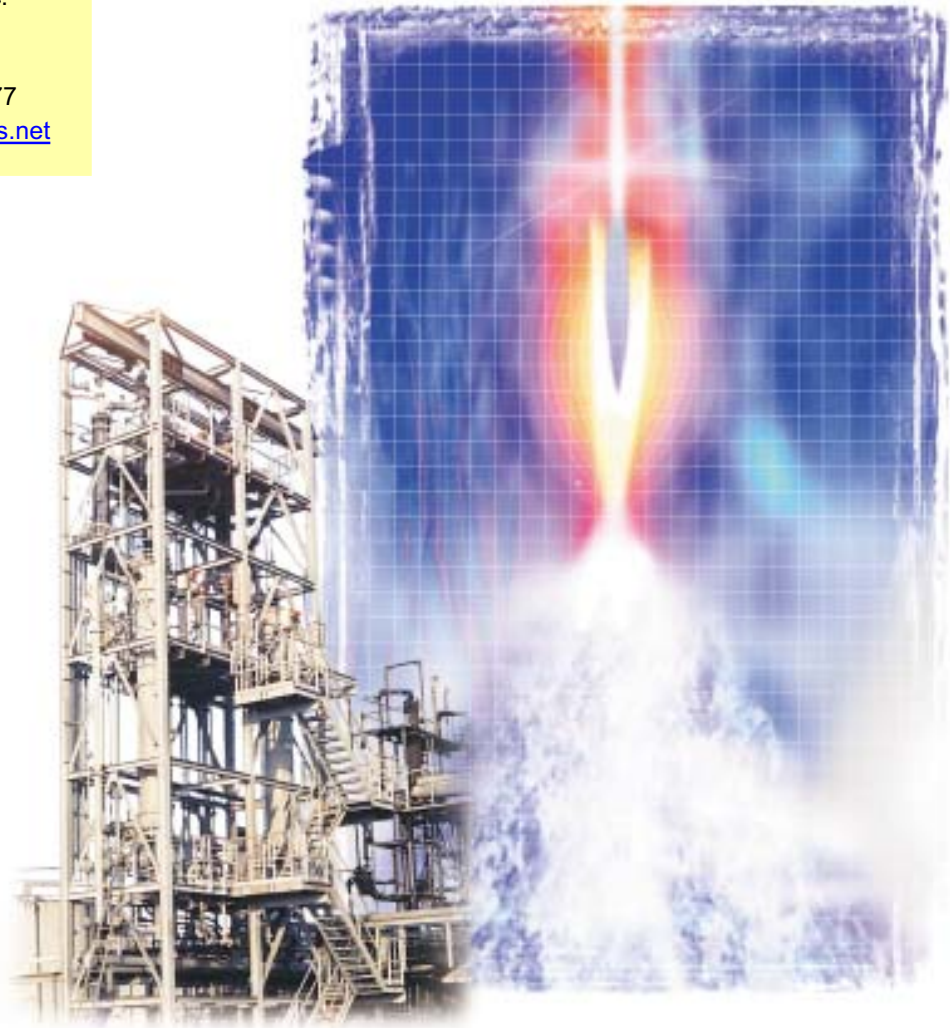
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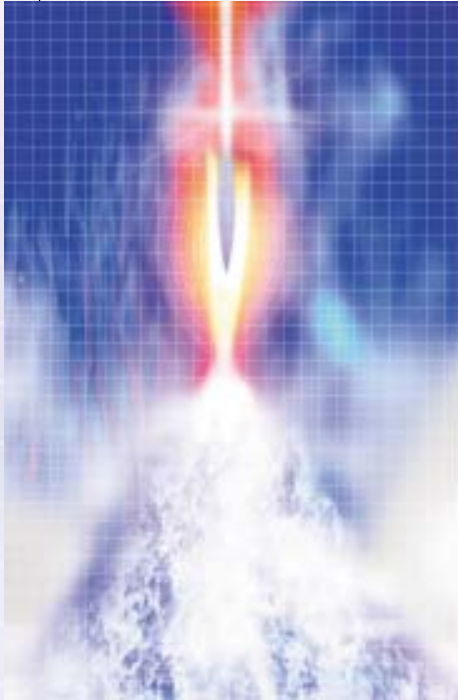
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SINTACLOR[®]



*CARBONE LORRAINE's
Hydrochloric Acid
Synthesis Units*

Synthesis of hydrochloric acid:



The synthesis of hydrochloric acid from chlorine and hydrogen is accompanied by the release of large quantities of heat (< 600 kcal/kg HCl produced), which increases the temperature of the HCl gas to more than 2,000°C.

Therefore, this gas usually has to be cooled before it can be used, usually resulting in extremely corrosive condensation of hydrochloric acid below a certain temperature.

CARBONE LORRAINE has developed materials with an exceptional resistance to temperature and thermal shocks.

- chemical inertia in the presence of hydrochloric acid and its impurities
- thermal conductivity
- good mechanical stability in the long term

They have enabled CARBONE LORRAINE to develop and make particularly compact and robust equipment capable of performing synthesis-cooling or synthesis-cooling-absorption operations.

This equipment is a SINTACLOR®.



SINTACLOR® CARBONE LORRAINE equipment with many advantages

CARBONE LORRAINE's SINTACLOR unit is based on the principle of combustion with a downwards flame:

Combustion with a downwards flame prevents the absorption solution from falling on the hot burner which could damage it.

- Combustion with downwards flame eliminates gas pockets that could contain toxic or unburned materials.
- Process equipment for combustion with downwards flame is more compact, so that mechanically the unit can be designed to resist higher pressures. Our synthesis units were tested at an effective pressure of 4.5 bars in the process.
- Combustion with downwards flame enables increased operating safety with a furnace completely isolated from the exterior without condensates purge.



Safety of the CARBONE LORRAINE's SINTACLOR unit for the synthesis of hydrochloric acid has been proven:

- 400 references throughout the world
- The use of GRAPHILOR® 3 that is particularly well adapted to extreme temperatures (2,000 to 2,500°C in the furnace) and corrosion conditions. GRAPHILOR® 3 has unequalled thermal stability approved by the T.Ü.V.
- Use of specific impregnation (CARBONE LORRAINE exclusive), GRAPHILOR® 3 XC for some parts of the reaction furnace and the first absorption block.
- Automatic ignition system outside the reaction furnace without any moving mechanical parts, and instrumentation readings in the control room.
- Our control cabinets are systematically equipped with a conventional relay safety system redundant with the safety PLC.
- An innovative burner design ensuring complete combustion of gases with minimum hydrogen excess (5%).
- The possibility of having an "All automatic" unit, that can be remotely shut down or started up daily.



SINTACLOR® CARBONE LORRAINE equipment with many advantages



The heart of the CARBONE LORRAINE process is the synthesis unit (or furnace/absorber) made from an impregnated graphite material embedded in a steel casing cooled by water circulation. The synthesis unit performs the following functions:

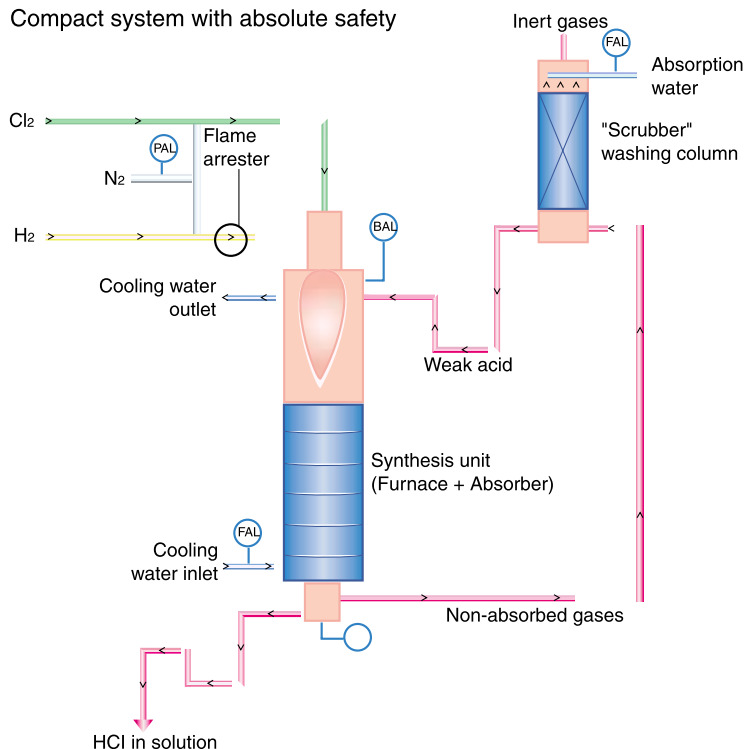
- Combustion
- Cooling of the gas
- Absorption
- Cooling of the solution

Chlorine gases and hydrogen enter through the upper part of the synthesis unit and react in a burner specially designed to enable complete combustion. This burner comprises two special tubes installed inside a GRAPHILOR® 3 impregnated graphite element. The burner tubes are installed inside an assembly equipped with seals and can be very easily withdrawn for maintenance. The burner is fitted with one inlet flange for chlorine and one for hydrogen.

Absorption water to hydrogen chloride gas is added in the upper part of the unit. The gas and the absorption water are then distributed in stacked graphite blocks so that they can be cooled later in vertical ducts in a cooling water circuit with water circulating backwards in horizontal ducts in the service circuit.

The gas and the solution only come into contact with GRAPHILOR® 3 impregnated graphite parts, thus eliminating all corrosion problems. The hydrochloric acid solution at the exit from the graphite blocks is separated from the gas, and the gas is then scrubbed in a tail column in order to recover unabsorbed hydrogen chloride gas.

Compact system with absolute safety



SINTACLOR® CARBONE LORRAINE equipment with many advantages

The synthesis unit normally operates at a pressure close to atmospheric pressure, however it is protected against over-pressures due to a GRAPHILOR® 3 rupture disk fixed near the lower part of the assembly and connected to a drum under the synthesis unit. If the pressure in the tank builds up, the rupture disk will break and relieve the pressure. The quantity of liquid and gas released when the disk breaks is relatively small.

The unit may be equipped with an automatic remote ignition system that uses a pilot type ignition device. This system was designed so that the entire unit can be started up from a "single button", or to enable any required intermediate option between manual and automatic startup.

This particularly compact equipment must be associated with auxiliary equipment in order to fulfill its role reliably and safely:

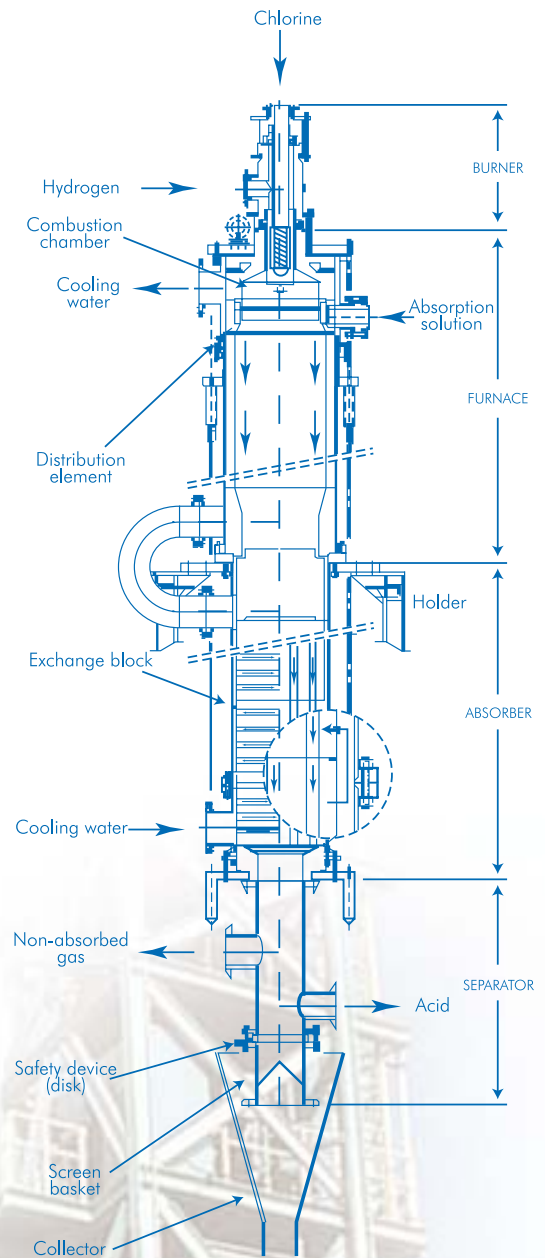
- A tail column, designed to scrub unabsorbed gases. These gases are mainly inert with a small proportion of hydrogen and a minute proportion of HCl.

Absorption water enters the top of the column through a distributor tube and flows under gravity over a carbon Raschig rings packing, while gases rise and are released into the atmosphere after scrubbing. The remaining HCl gas is absorbed during this operation.

The tail column is made entirely of GRAPHILOR® 3 (impregnated graphite) and is fitted with a thermowell pocket into which a temperature sensor can be fitted.

- A flame arrester

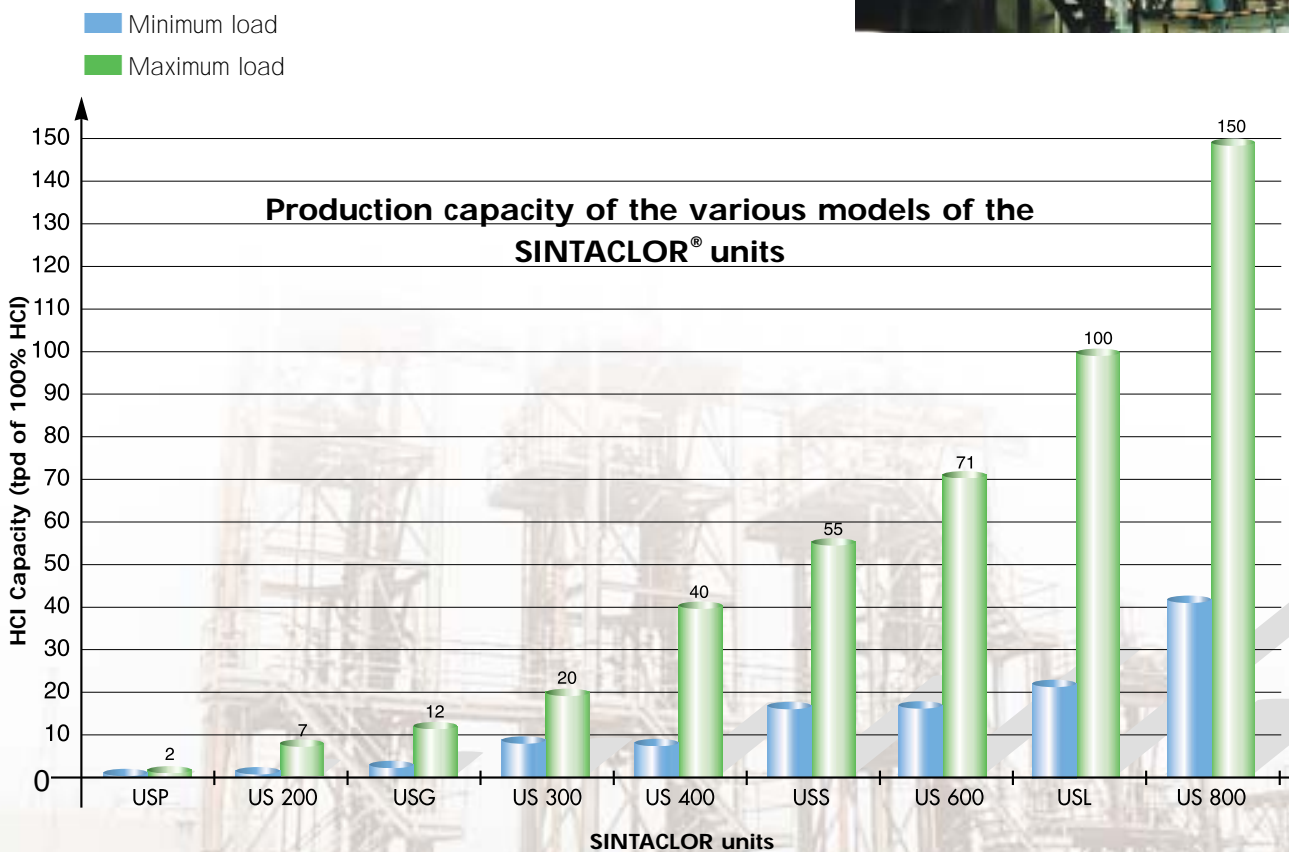
The hydrogen line is equipped with a flame arrester immediately before the burner inlet. Certificates corresponding to European safety standards may be provided.



SINTACLOR®

a diversified range

The SINTACLOR range includes units capable of producing hydrochloric acid quantities varying from 1.4 to 150 t of 100% HCl per day, due to the diversity of cooled absorber profiles used in the SINTACLOR unit. Furthermore, production flexibility is remarkable due to the use of interchangeable burners.



The maximum and minimum capacities may vary as a function of process conditions. Please call CARBONE LORRAINE to help you optimize performances.

Model	tpd of 100% HCl	Burner type	Block type
USP	1.4 to 2	P	PMA
US 200	2 to 7	P or G	N 216 S
USG	7 to 12	G or S	GM 16 A
US 300	12 to 20	G or S	N 316 S
US 400	20 to 40	S or L	N 416 S
USS	40 to 55	L or IL	SM 18 A
US 600	55 to 71	L or IL or ILS	N 616 S
USL	71 to 100	L or IL or ILS	N 816 S
US 800	100 to 150	ILS or XL	N 816 S

Capacities given are applicable under the standard operation conditions described below:

- Cl₂ content in Cl₂ stream and H₂ content in H₂ stream > 95% vol.
- H₂ excess: 5% above the stoichiometric quantity
- Acid produced: 33% at 40°C
- Absorption water: inlet temperature < 30°C, fouling = 10,000 kcal/h.m².°C
- Cooling water: inlet temperature < 30°C, ΔT = 10°C minimum, fouling = 5,000 kcal/h.m².°C

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WORLDWIDE SPECIALIST in industrial components

Since its founding in 1892, CARBONE LORRAINE has built an international reputation by creating subsidiaries on all continents. Today with industrial and commercial plants located in more than 30 countries, agencies and representatives in more

than 70 countries and 250 commercial contacts throughout the world, CARBONE LORRAINE offers its customers worldwide reliable, high technology products and the service of its experienced technicians.

A worldwide organization

