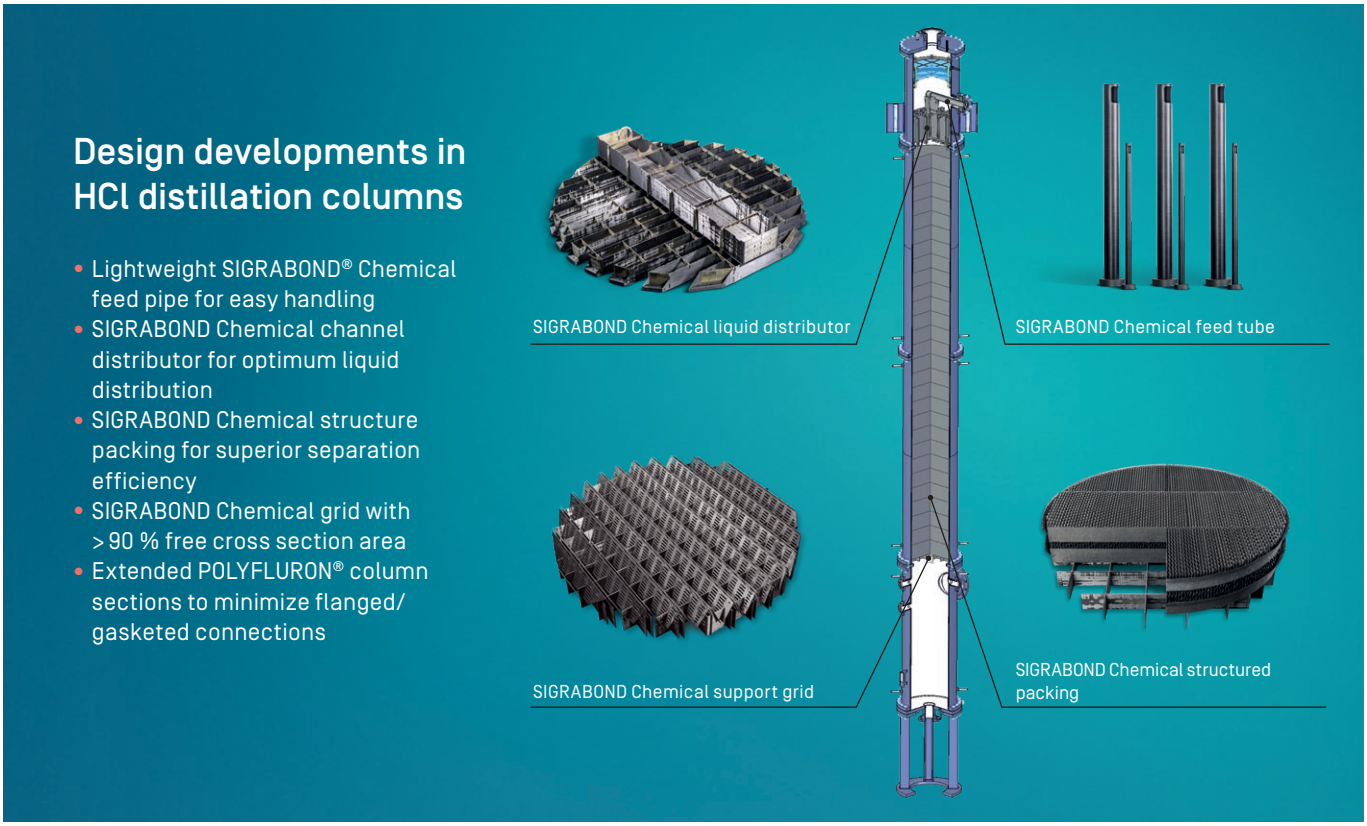
sgl carbon

State-of-the-art column design for HCl distillation

Process Technology – White paper



↑ POLYFLURON column with SIGRABOND Chemical CFC internals designed with four steel sections

When high-purity hydrogen chloride gas is required at elevated pressure, HCl distillation units are frequently applied.
SGL Carbon's new developments for column internals and shells improve the reliability, energy efficiency and compactness of our systems.

This allows us to approach more extreme conditions in respect of pressure and temperature for this highly corrosive application. Our process design specialists are available for new inquiries or for column upgrades to the latest technology.

Column design for HCl distillation

The potential applications for HCl distillation units cover a wide range. Higher capacity units that are optimized for reliability and utility consumption include applications that need high pressure HCl gas, e.g. for chlorosilane or methyl chloride production. Applications in the electronic grade industry, on the other hand may focus less on utility demand due to the small capacities applied but require ultra-pure HCl gas.

This white paper is limited to the column design and is not a holistic review on all aspects of HCl distillation systems. The design or revamp of a column for HCl production is not limited to just capacity and product quality. Balancing energy demand and investment costs, selecting process conditions that are optimized for the applied materials, and a robust mechanical design that minimizes the risk of downtimes are key aspects to be considered.

For example

A POLYFLURON (PTFE-lined carbon steel) column was replaced at the end of its lifetime after almost 30 years of operation. The unit had been constructed out of ten sections including various graphite (DIABON®) internals that required many support devices.

First, the originally designed heavy-walled carbon grids and distributors were replaced by lightweight equivalents made of carbon fiber composites (SIGRABOND Chemical). The outstanding mechanical properties of these new state-of-the-art materials enable grids to be produced with huge free cross-sections that are not subject to hydraulic limitations.

This material also allows the design of distributors with complex geometries, leading to improved liquid distribution on the packing and minimal energy consumption. The superior thermal shock resistance and non-ceramic fracture behavior qualify SIGRABOND Chemical as the perfect material for the harsh conditions of the pressure column [1].

For optimum mass transfer and turn-down behavior, a structured packing made of carbon fiber (SIGRABOND) replaced the existing carbon Raschig Rings. This allowed the reduction of the column diameter by 20 % and made it possible to eliminate several support devices.

The material of this structured packing is not proven only by the excellent temperature resistance of up to 350 °C; it also significantly improves the irrigation properties compared to packings made of plastics, by providing an enhanced contact area between gas and liquid.

By achieving an optimum liquid distribution, a superior packing geometry can result in steam savings in this highly energy intensive process.

Newly developed techniques at our POLYFLURON production site at Dr. Schnabel have allowed the production of longer PTFE-lined spool sections. Maximizing the length of the sections combined with a smarter design resulted in the reduction of the number of steel spools from 10 to 4, leading to significantly less gasketed connections.

Please contact us to discuss possible improvements of your existing column. We use our rate based simulation tools to conduct economic reviews and consult on improvements for both internals and column shell.

[1] CPP cpp0218sgl “Increase demand for efficient processes”
C. Woltz, SGL Carbon

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White paper.00 / 03 2022
03 2022/0 E Printed in Germany