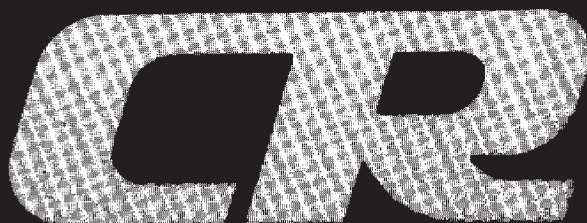


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SILICON TETRACHLORIDE FUME PROBLEM SOLVED



CROLL-REYNOLDS CO., INC.

P.O. Box 668, Westfield, NJ 07091-0668 • (201) 232-4200/TWX-710-997-9642

**ENVIRONMENTAL
CONTROL EQUIPMENT**

- venturi fume scrubbers
- packed towers
- tower packing
- cooling towers

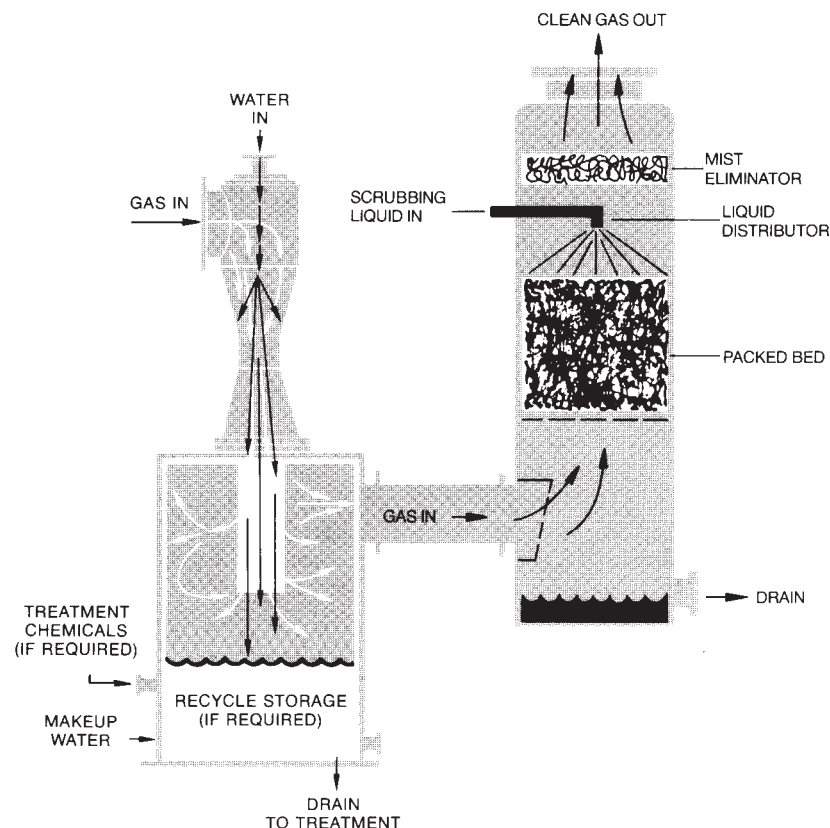
VACUUM EQUIPMENT

- multi-stage ejector systems
- combination liquid ring pump/ejector systems
- liquid ring vacuum pumps
- thermocompressors
- condensers - surface or direct contact
- vacuum refrigeration systems - Chill-Vector™
- distillate recovery systems - Scrub-Vector™

FACILITIES ENGINEERING®

Edited by Jeanine Katzel

Two-Stage Scrubber System Solves Fume Problem



A two-stage jet-venturi fume scrubber/packed tower system (photograph) helped solve multiple pollution problems for Teledyne. The system eliminates hydrochloric acid fumes released by a silicon tetrachloride byproduct formed in the processing of zirconium. The scrubber (left drawing) entrains large volumes of gases without the use of complicated baffles or moving parts. The pack tower (right drawing) supplements the scrubber, eliminating fugitive emissions and containing potentially hazardous fumes.

A TWO-STAGE JET-VENTURI scrubber/packed tower system solved a number of pollution problems for an Albany, Oregon, company.

The Zirconium Extraction Div. of Teledyne Wah Chang produces high-quality reactor-grade zirconium and hafnium oxide using a chemical separation process. The zirconium and the hafnium are chlorinated and then formed into

pure metals for the nuclear and chemical process industries.

The processing of zirconium produces silicon tetrachloride (SiCl_4) as a byproduct. The crude inorganic chemical is stored in a tank farm, processed into pure SiCl_4 , and sold as a raw material to other chemical processors. Because the silicon tetrachloride generates hydrochloric acid (HCl) fumes when it comes

in contact with moisture, the plant needed a way to eliminate fugitive emissions to conform with EPA requirements and a scrubber system that would contain any potentially hazardous fumes that might escape when workers performed maintenance in the tank farm.

To perform efficiently, the system required a scrubber close to the tank farm and designed to handle an inlet flow rate of 3000 to 4000 acfm. In addition, it had to handle an outlet gas concentration of 100 ppm of SiCl_4 , based on an inlet concentration of 10 percent by volume, and have an overall efficiency of 99.9 percent.

The company selected a two-stage system—Model 18 x 18-66V Jet-Venturi Fume Scrubber/Separator unit and 48T-12H Packed Tower—from Croll Reynolds, Inc., Westfield, NJ. This system was selected for three reasons:

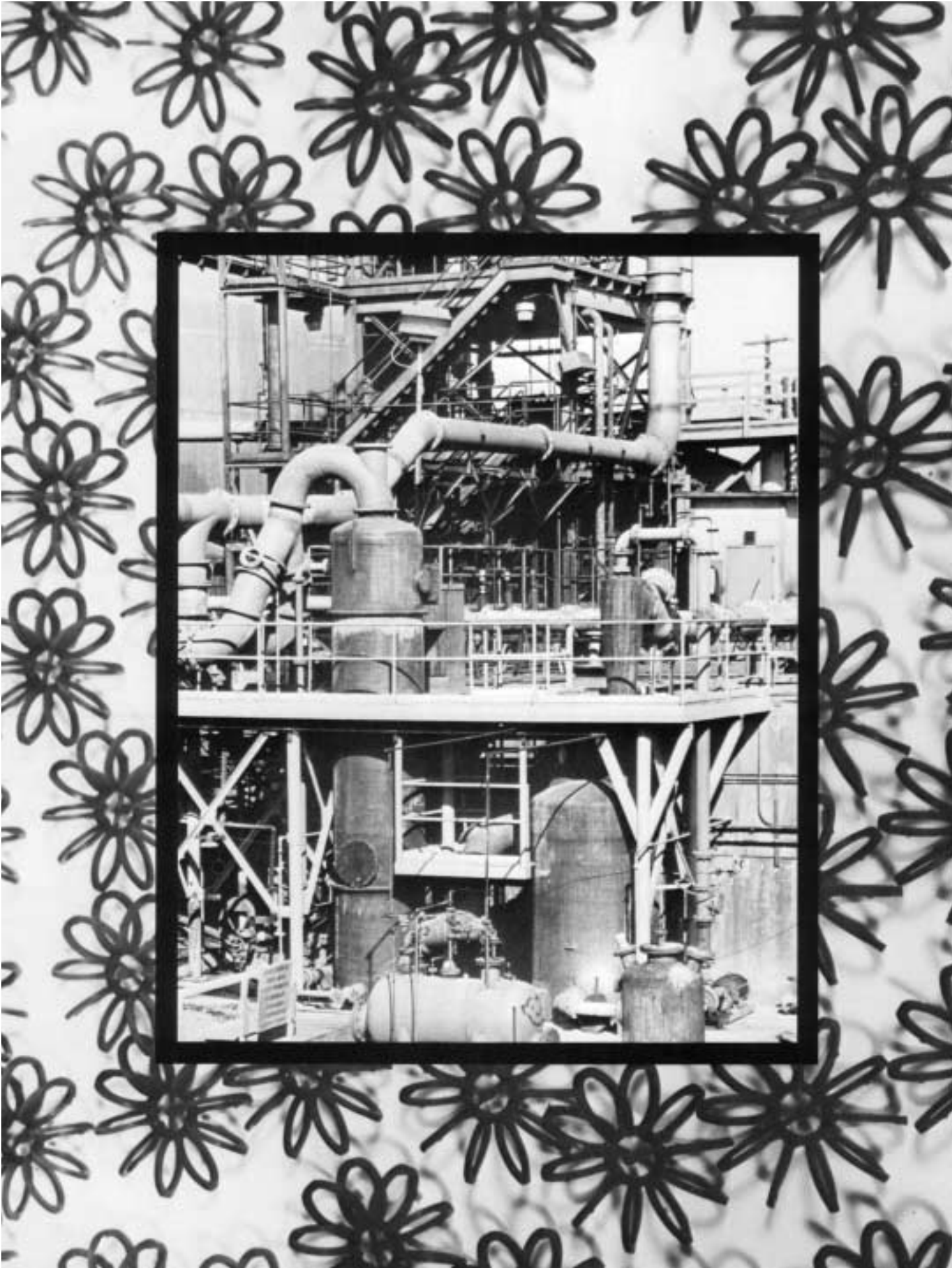
1. It could handle the sticky gel formed when silicon tetrachloride decomposed in water
2. It has a high liquid-to-gas ration that provides efficient gas scrubbing of HCl
3. Any HCl that may escape is easily scrubbed by the packed tower.

The fume scrubber is designed to entrain and scrub large volumes of gases without the use of baffles or moving parts. Motivating fluid (generally water) leaves the nozzle in a hollow cone spray, creating a draft that draws the gases and vapors into the moving stream where they are continuously scrubbed and absorbed.

Excessive fouling is prevented with the use of a Chevron impact type separator element developed for applications in which solids buildup is anticipated. A continuous washing action keeps the blades clean at all times.

For the second stage of the process, a scrubber material in the packed tower handles residual low concentrations of SiCl_4 and HCl. It channels the gas flow upward, through a packed bed; the scrubbing liquid flows down by gravity over the packing.

The packing material had to be selected carefully to prevent solids plugging. Molded polypropylene loops, called Spiral Pac®, were used to obtain a maximum mass transfer area. Liquids and gases come in contact with inside and outside surfaces, preventing gel buildup and providing the high HCl scrubbing capacity.



Write for further information.



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