

# Tri-Mer High-Efficiency Gas Scrubbers: a Cost-Effective Solution for High-Load Applications

Today's requirements dictate removal of many gas phase and fume contaminants to – or below – threshold limits values. Scrubber systems delivering this level of removal use dual-stage chemical scrubbing. The Tri-Mer scrubber uses its initial stage to remove the majority of the inlet load; subsequent stages are polishing units, which bring system capability down to very low levels – often 1 ppm and lower.

## Scrubber Design

Tri-Mer scrubbers are conservatively engineered. This is particularly true as it relates to calculations on gas flow through the column. Generally, gas flow should not exceed 300 ft./min for these systems. Undersized columns operating at excessive velocity are common sources of operational difficulties, and are never used on Tri-Mer systems.

## Liquid Recirculation

Recirculation flow rates of Tri-Mer gas scrubbers are 10 to 20 gpm per sq. ft of scrubber cross section. This assures maximum contact between incoming contaminant and scrubbing liquor.

Many industrial gas scrubbers recirculate at too low a rate. This “downsizing” produces scrubber inefficiency, which is worsened when coupled with a too-small scrubber column diameter. The result is over-velocity and under-flow, a combination that does a disservice to the owner.

Tri-Mer systems are engineered for optimum velocity and flow rates, and maximum operating efficiency, both short and long-term. Tri-Mer scrubbers are widely recognized as the most efficient wet gas and fume scrubbers available.

## Packing Depth

In addition to tower diameter and liquid recirculation rate, consideration must be given to the HTU analysis required to develop the necessary tower packing depth for each stage. Analysis is made of the inlet load characteristics and outlet load target. One difference between Tri-Mer scrubbers and others is packing depth. Tri-Mer scrubber designs are based on considerations that have been field-proven and validated over decades. Tri-Mer scrubbers are built exclusively on hard data from successful installations.



Multi-stage NO<sub>x</sub>, HCl, Cl<sub>2</sub> systems



Dry sump design



Gas transfer duct between stages



**Tri-Mer**<sup>®</sup>  
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## Design

### Submicron Particulate

Where submicron particulate in the gas stream is an issue, Tri-Mer offers several options for submicron particulate control, including [venturi systems](#) and [Cloud Chamber](#) technology.

The Cloud Chamber is the more advanced alternative: it eliminates particulate from 300 microns down to 0.1 microns at efficiencies of 99.99%. Most notably, the Cloud Chamber uses just 600 watts of power. The Cloud Chamber is an excellent alternative when particulate is suspended in high-temperature gas streams.

### Gas Quenching

Hot gases from kilns, ovens, incinerators and flue gas sources, may demand a gas quencher ahead of the scrubber. A [venturi](#) or [Cloud Chamber](#) can act as both gas quencher and particulate removal device.

### Gas Stream Heating

Heat exchangers provided by Tri-Mer reheat the inlet gas stream to proper operating temperature. Reheating the exhaust stack is done in rare instances to eliminate visible water vapor discharge.

### Particulate Removal

Where particulate is above 1 micron, Tri-Mer's [Whirl/Wet](#) dust collector interfaces with the gas scrubber for low-cost dust collection that is also very low in maintenance requirements. Energy generated inside the Whirl Wet will not allow the system to clog under any operating conditions, and the system uses very little water.

### Scrubber Configurations

The vertical packed bed design is preferable for most gas scrubber installations due to the advantages of gravity, which equally disperses scrubbing liquid over the packing media from single-point distribution nozzles. For installations with height restrictions, Tri-Mer will engineer an equivalent horizontal scrubber. The system will operate as a dry sump with two stages.

Vertical and horizontal quencher designs are available in ceramic-lined or high alloy steel.

### Process Instrumentation

Tri-Mer provides complete instrumentation, including PC or PLC and NEMA-4 panel, pH, ORP, and temperature control, air sensors, and stack monitoring. Systems can be set up for FMCS interface.

### Construction Materials

Tri-Mer gas scrubbers are polypropylene, PVC or stainless steel. We strongly recommend homogeneous materials that do not rely on coatings or veils for performance. Only high-integrity, homogenous materials are suitable for the aggressive environments encountered by these scrubber systems.



A 28,000 CFM Cloud Chamber scrubber



Quencher system under multi-stage gas scrubber



Special multi-stage gas scrubber field-tested unit



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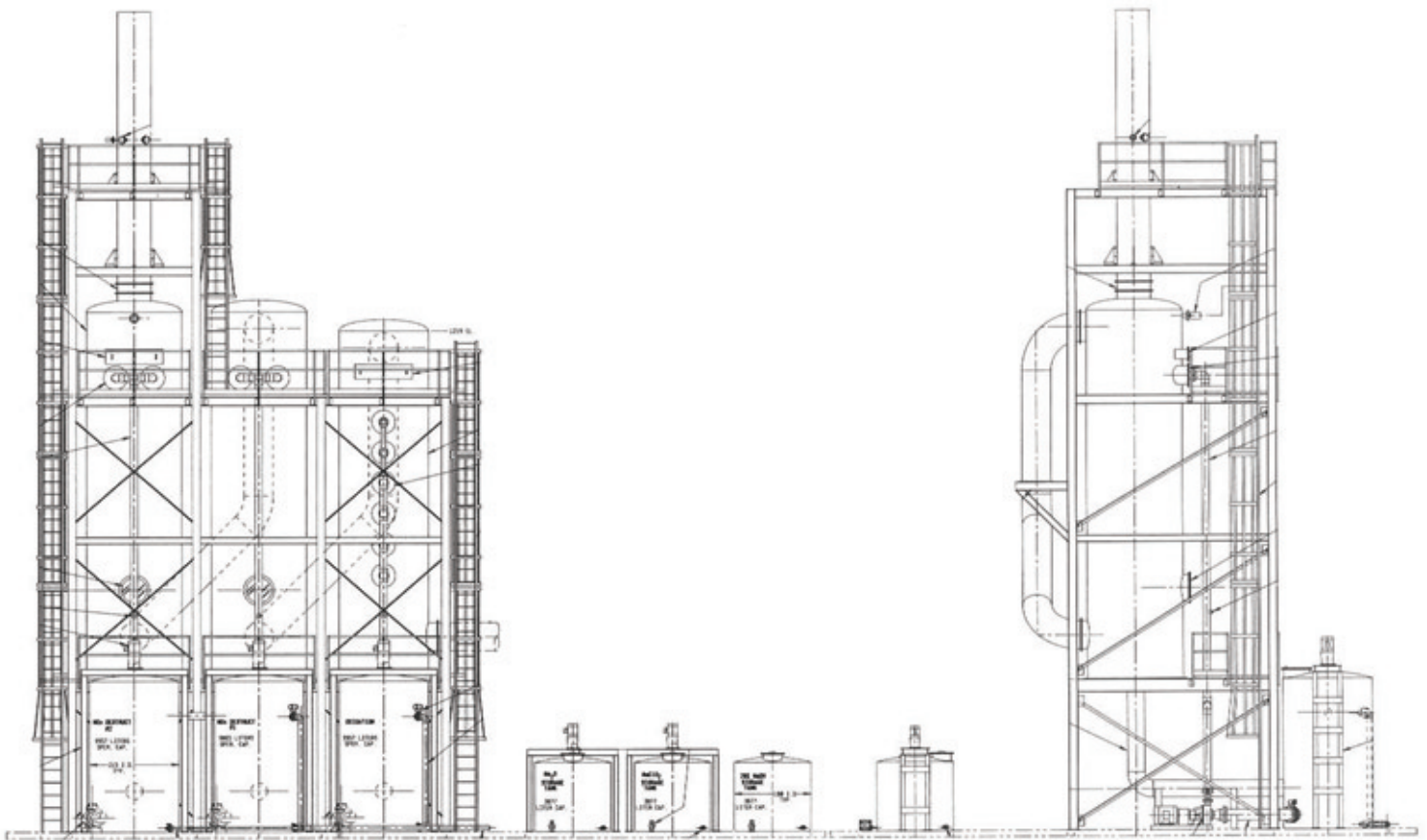
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# MULTI-STAGE SCRUBBER

This drawing shows the design adaptability of a Tri-Mer multi-stage gas scrubber. This scrubber is applied to a source generating particulates, chlorine and amines. The scrubber simultaneously eliminates dust and particulate, gas loads and odor.



## **HCl/Cl<sub>2</sub> Incinerator Scrubber**

(front and left side elevation)