

# *UltraCat* Catalytic Filter Systems



Particulate • NO<sub>x</sub> • SO<sub>x</sub> • HCl • VOC • O-HAP • Hg • D/F • CO



*Tri-Mer has installed more Catalytic Ceramic Filter Systems  
than all other suppliers combined, **worldwide.***

# Tri-Mer Corporation is the World's Largest Supplier of Ceramic Catalyst Filter Systems

## All-in-One Solution

Tri-Mer UltraCat Catalytic Filter Systems are state-of-the-art for removing particulate (PM), SO<sub>2</sub>, HCl, mercury and heavy metals. Simultaneously, the ceramic catalyst filters destroy NO<sub>x</sub>, cement organic HAPs, and dioxins. Systems can be configured for any combination of the pollutants.

The system is completely dry, with no water consumption. Disposal of the dry collected waste is straightforward. Large gas flow volumes can be accommodated.

**PM • SO<sub>x</sub> • NO<sub>x</sub> • VOC • Dioxins • HCL • Hg • CO**

*Boiler MACT • CISWI MACT • Lime MACT 2*

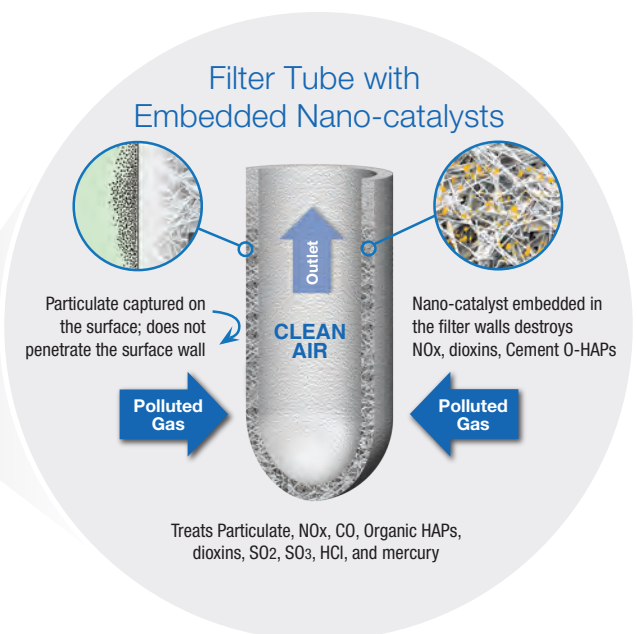
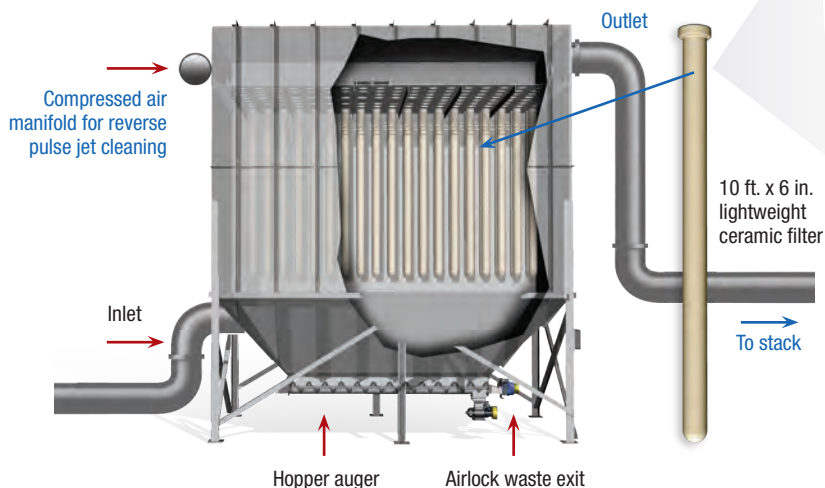
*HWC MACT • Cement NESHAP • Title V Compliance*

*CARB Diesel Regs • EPA Glass Regs • EPA Ceramics Regs*



## System Architecture

Ceramic filter tube wall is 3/4" thick with catalyst embedded throughout the wall. Filters are self-supporting without filter cages, and have a service life of 5 to 10 years.



Catalyst is inside the filter walls, protected from PM blinding and poisoning.



## Particulate Control

Tri-Mer's UltraCat Filter System removes particulate from gas sources above 300°F, including PM10, PM2.5, and submicron. Typical outlet levels are less than 0.001 grains / dscf (2.0 mg/Nm<sup>3</sup>) regardless of inlet loading. Heavier loadings require more frequent pulse-jet cleaning of the filters but outlet levels remain the same.

## NOx Control

UltraCat Catalytic filter tubes have nanobits of SCR catalyst embedded in the filter walls. Operating range is 350°F to 950°F. The large reactive surface area of the micronized catalyst produces high NOx removal at temperatures lower than standard SCR. Good results start at 350°F and improve to 95% removal at 450°F and above.

The unique structure of the filters captures process particulate on its outer surface, keeping it away from the nano-catalyst inside the filter walls. This prevents PM blinding and poisoning of the catalyst, and greatly extends the catalyst life compared to standard SCR.

## Cement O-HAPs, Dioxin, VOCs

The VOCs designated as organic HAPs in cement regulations are destroyed by the embedded catalyst. Good removal on the primary Cement O-HAPs occurs at temperatures over 400°F, with excellent results on all Cement O-HAPs approaching 500°F. Other VOCs are also selectively destroyed. Dioxins are eliminated by the filters, typically with 95% efficiency or higher.

## SO<sub>2</sub>, SO<sub>3</sub>, HCl, HF Removal Using Dry Sorbent Injection

Systems have an option for dry sorbent injection of calcium or sodium-based sorbents (hydrated lime, sodium bicarbonate and trona) to remove SO<sub>2</sub>, SO<sub>3</sub>, HCl and HF.

Powdered sorbents are injected upstream of the filters and the reaction by-products captured as particulate at the filters. The SO<sub>2</sub> removal reaction occurs within the duct leading to the filters and at the sorbent cake that accumulates on the surface of the filters. The chemical reaction of the sorbent with the acid gas creates a solid particle that is captured on the filters, along with the unreacted sorbent and the process particulate.

With dry sorbent injection, SO<sub>2</sub> removal is typically 90-95%, with removal efficiencies as high as 97%. HCl removal is typically 95%, and often as high as 99%. The temperature range for effective removal is 300°F to 1600°F.

## Mercury Control

The system removes mercury using injection of dry sorbents. Powder activated carbon and other sorbents, some pre-blended with the acid gas sorbents, are selected on a case-by-case basis. Mercury control is a key feature.

## CO Removal

Tri-Mer systems can be configured to remove Carbon Monoxide, simultaneously with other pollutants, at temperatures of 450°F and above.



## A Revolution in NO<sub>x</sub> Control

- Very high removal efficiency, greater than 90%
- Greater than 90% removal at 400°F.
- Extended catalyst life because the micronized catalyst is embedded within the body of the filter and protected from blinding and poisoning.

The combination of these factors has revolutionized NO<sub>x</sub> removal, especially for applications that have temperature limitations and/or require the simultaneous removal of other pollutants.

At even lower temperatures, 350°F, the UCF system will remove NO<sub>x</sub> at approximately 70% efficiency. In addition to NO<sub>x</sub>, catalytic filters will remove PM, Cement O-HAPs and dioxins, and can be configured to remove CO, SO<sub>2</sub>, HCl, and HF. Regulatory authorities have recognized the Tri-Mer UCF system to be a major advance in NO<sub>x</sub> and multi-pollutant control technology.

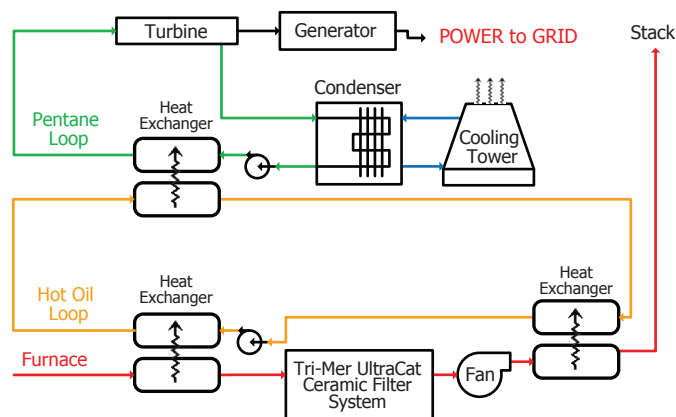
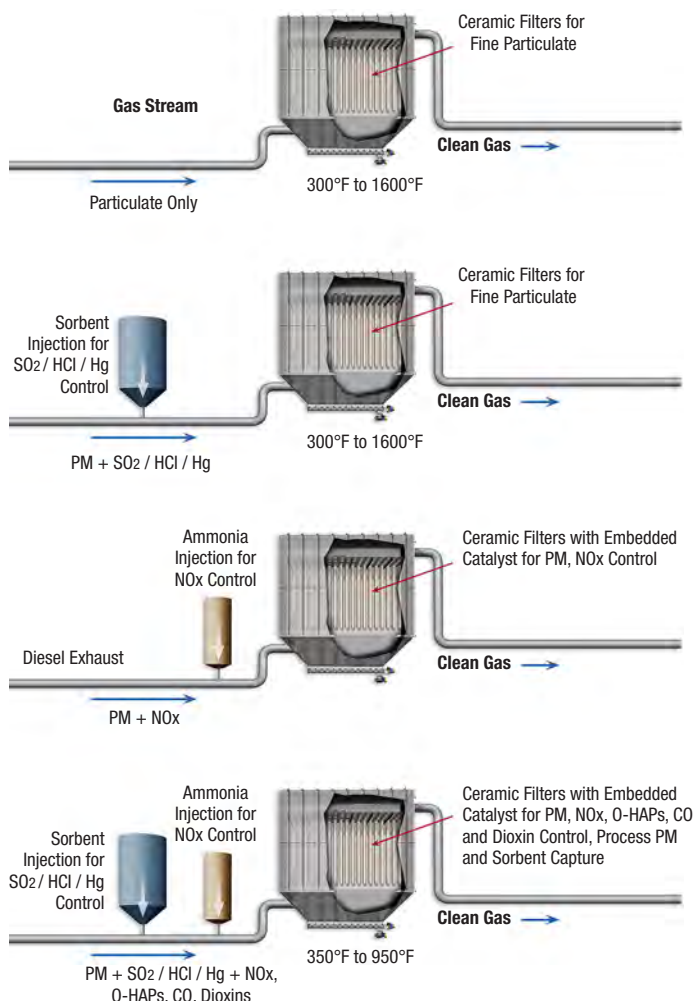
## UltraCat Catalytic Filter and Power Generation Systems

Tri-Mer UltraCat filter systems are ideal for maximizing the energy that can be extracted from furnace exhaust for use in an Organic Rankine Cycle (ORC) power generation loop. The heat is transferred to a hot oil intermediate loop, and then to an ORC loop (see figure below right).

Conventional technologies such as ESP and SCR have narrow hot operating ranges, and sizable heat loss across their combination. In contrast, the UCF is equally effective for pollutant removal over a very wide temperature range, including cooler temperatures (see NO<sub>x</sub> figure above), with a very low heat loss. The high tie-in temperature at the upstream heat exchanger, combined with a much lower exit temperature to the UCF system creates a greater  $\Delta T$ . This increases thermodynamic efficiency. After the UCF cleans the gas, a second downstream stage of heat recovery is incorporated.

The UCF flexibility allows continued control of emissions in the event the power generation loop goes offline for maintenance, making the UCF system the ideal pollution control technology to pair with heat recovery.

## Several Versions of One Highly Effective System



The Tri-Mer System presents the optimal combination for pollution control performance and electrical power generation.



Technology Leader  
air pollution control