



GAS CLEANING SYSTEMS

TOTAL INTEGRATED SOLUTIONS

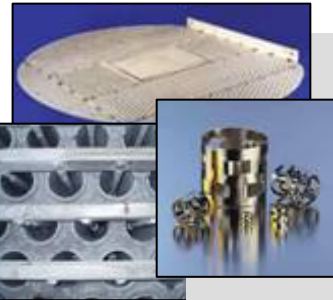
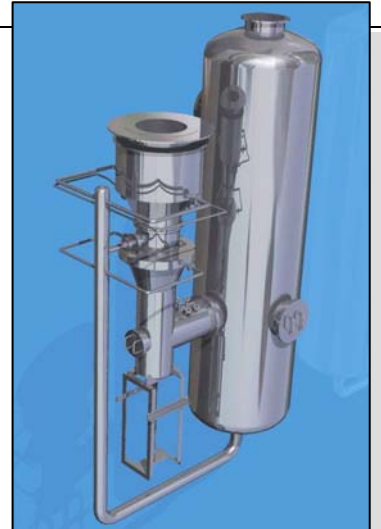
Hamworthy Combustion designs and supplies individual Gas Cleaning Systems (Scrubbers) to reduce pollutant emissions from stationary sources down to the emission levels set by Local Authorities. Compliance with EU Directives, US EPA Regulations, RCER 2004 or Customer special requirements is ensured through extensive application of leading edge technologies and multi-pollutants absorption process approach.

We serve the refinery, petrochemical, chemical, pharmaceutical, fertilizer, power and process industries through the following technologies:

- Quenchers
- Tray Scrubbers
- Wet Electrostatic Precipitators
- Bag Filters
- SNCR De-NOx Scrubbers
- Acid Recovery Units
- Venturi Scrubbers
- Packed Bed Scrubbers
- Fiber-Bed Scrubbers
- Dry Electrostatic Precipitators
- SCR De-NOx Scrubbers
- Urea Dust Scrubbers

Our Customers benefit from a comprehensive range of design options:

- Custom design
- Turnkey packages
- ASME design
- Product recovery
- Preferred environmental solutions
- Plastics, Graphite and High Alloys





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QUENCHERS

Hamworthy Combustion's Gas Quencher, thanks to its expressly developed dual feed technology, ensures the effective and complete adiabatic saturation of exhaust and off gases even at very high temperature. Quencher design has been developed for severe, dirty application with sticky dusts typically generated by waste water incineration and is suitable also for acid and corrosive gases such as those coming from off-gas or vent-gas incineration units.

Complete adiabatic saturation is ensured even at turn-down ratios as low as 20% of design gas capacity with no need for automatic control loops on circulation rates.

Gas temperature as high as 1,200°C (2,200°F) and quenched gas flow rates up to 170,000 m³/h (100,000 acfm) can be processed in a single unit.



VENTURI SCRUBBERS

Hamworthy Combustion's Venturi Scrubber is expressly designed for ensuring cutting edge collection efficiency on dust and aerosols generated by modern Thermal Oxidizers where very fine dusts are usually generated and variable gas flow rates are customary due to the fluctuations on the amount and composition of the incinerated wastes.

Up to 98% collection efficiency on 1.0 µm equivalent diameter dust particles can be achieved. High-Energy Venturi Scrubbers with pressure drop up to 250 mbar for high efficiency on sub-micron particles can be supplied.

Gas flow rates up to 170,000 m³/h (100,000 acfm) can be processed in a single unit.

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WET SCRUBBERS

Hamworthy Combustion's Scrubbing Towers are individually designed to reduce pollutants emissions (SO₂, HCl, Cl₂, HBr, Br₂, HF, NH₃, etc.) from stationary sources like Hazardous Waste Incinerators down to the emission levels set by Local Authorities. Compliance with EU Directive 2000/76/EC, US CAA/NESHAP, RCER 2004 is ensured through multi-pollutants absorption process design and latest generation Mass Transfer Equipment.

Our Scrubbers can achieve up to 99.99% collection efficiency on gaseous pollutants and up to 99% collection efficiency on dust particles with 10.0 µm equivalent diameter. Gas flow rates up to 140,000 m³/h (82,500 acfm) can be processed in a single circular scrubber ID 4,500 mm (15 ft). Higher flow rates can be handled by increasing the tower diameter.

Depluming capabilities can be added to the wet scrubber for eliminating any visible plume from the stack or to minimize water consumption. Wet Scrubbers can also be designed to act as Acid Recovery Units to allow the recovery of the scrubbed acid as valuable concentrated solution.

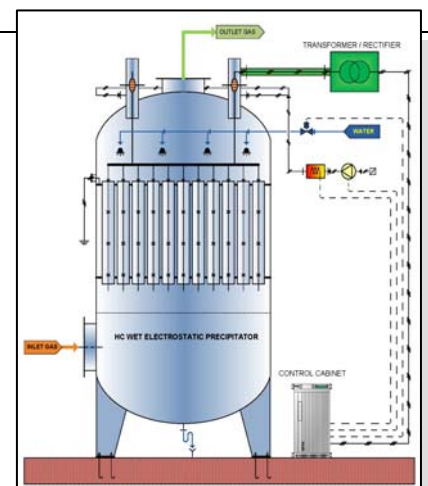


WET ELECTROSTATIC PRECIPITATORS

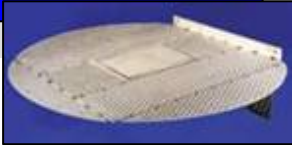
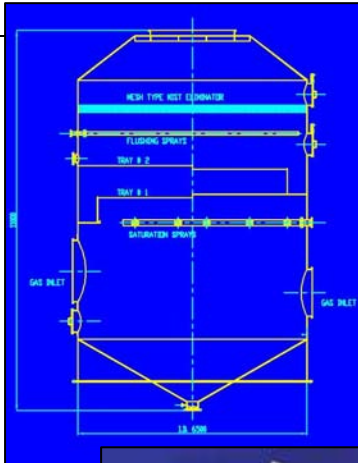
Hamworthy Combustion's Wet Electrostatic Precipitator has been developed as the ideal polishing filter for improving the particulate matter and/or aerosol collection efficiency of any existing wet scrubbing system to comply with the latest Environmental Regulations at minimal additional pressure drop.

Collection efficiencies higher than 98% are achievable on particulate matter and aerosols independently from their equivalent size. Wet Tubular Design with Flushing Sprays ensures suitability to severe services with sticky dusts.

A single round-shaped Wet ESP ID4500 mm (15ft) can process 51,000 m³/h (30,000 acfm) of saturated gas with less than 5 mbar pressure drop, 38 kW/h electrical power consumption and 2 tons/day fresh water consumption. Higher flow rates can be processed with twin installations or special design.



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UREA DUST TRAY SCRUBBERS

Hamworthy Combustion's Urea Tray Scrubbers are individually designed for effectively removing Urea Dusts from exhaust gases generated by modern Urea Granulation Plants. Collected Urea Dust is recovered as an aqueous solution while plant stack emissions are reduced down to the limits set by Local Authorities. Compliance with EU Directives, US EPA, RCER 2004 is ensured through accurate process design and application of best-in-class Mass Transfer Equipments.

Besides traditionally round-shaped scrubber vessels, square-shaped vessels are available for MEGA Urea Plants where maximizing space occupation and facilitating shipping and transport activities are key factors.

Our Scrubbers are designed to achieve and exceed 99% urea dust collection efficiency both on Cooler line and on Granulator line where finer dust are expected. Gas flow rates up to 140,000 m³/h (82,500 acfm) can be processed in a single round-shaped scrubber ID 4,500 mm (15 ft). Higher flow rates can be handled by increasing the tower cross section.



DRY SCRUBBING SYSTEMS

Hamworthy Combustion's Dry Scrubbing Systems offer state-of-the-art solutions for NO_x, SO_x and Dust removal from Flue Gas generated by the Power Industry. Our portfolio includes:

- SNCR (Selective Non-Catalytic Reduction) De-NO_x Scrubbers
- High-Dust SCR (Selective Catalytic Reduction) De-NO_x Scrubbers
- Tail-end (Low-Dust) SCR De-NO_x Scrubbers
- Dry ESP (Electro-Static Precipitators) De-Dust Scrubbers
- Bag-house Dust Filters
- Spray Dryer De-SO_x Scrubbers

All our systems are individually designed to comply with the most stringent Emission Limits and with the International Engineering and Design Standards.