

ENVIRONMENTAL COMPLIANCE & ENERGY RECOVERY

Standard & Customized Solutions
for Purification of Process Air Streams



ENGINEERED SYSTEMS & SERVICES



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Translating Ideas into Sustainable Solutions

Clean Technologies for Environment, Climate & Energy

- Air Pollution Abatement
- Carbon Management
- Energy Recovery
- Bio Fuels & Renewable Energy

MEGTEC is a long-recognized world-class supplier of engineered systems and services for air pollution abatement systems for Volatile Organic Compounds (VOC), Hazardous Air Pollutants (HAPs) and odor control applications. In addition to our well-known oxidizer product line, MEGTEC offers carbon adsorption and distillation technologies for recovery and reuse of expensive or large quantities of solvents.

Now, through our most recent acquisition, we are pleased to announce that MEGTEC TurboSonic provides advanced solutions for particulate removal, acid gas cleaning and gas conditioning as well as state-of-the-art liquid atomization technologies.

While many suppliers offer equipment only, MEGTEC offers the total solution. With more than 40 years of process knowledge and over 5000 installations worldwide, we have the experience to review and understand your compliance and energy needs.

MEGTEC is committed to working with their customers to provide best-value systems:

- for regulatory compliance
- for improvement in working environment and in neighbor relations by odor reduction
- for the reduction of greenhouse gas emissions
- for process energy management
- for increased profitability and return on investment

MEGTEC provides specific turnkey solutions for treatment of process gases/exhaust streams as well as for odor and particulate control applications.

- Stand-alone particulate control, acid gas removal, VOC/HAPs destruction and/or solvent recovery technologies
- Combined wet electrostatic precipitator (WESP)/oxidation packages for VOC removal in particulate-containing process streams
- Combined oxidizer/scrubber systems for acid gas removal for treatment of e.g. Cl-containing process gas components
- Treatment of high volume, low concentration (HVLC) streams with combinations of zeolite adsorption/desorption and thermal oxidizers
- Applications with need for extraordinary materials of construction for acid gas streams or other special components
- Complete process energy management providing heating by thermal oil, steam, warm and cold water, including electricity generation
- Treatment of condensable exhaust streams
- Incineration of liquid waste streams by injection in thermal oxidizers
- Pre-assembled, modular designs for easy installation, expansion to facilitate relocation

Full Range of Engineered Systems & Services for Environment, Climate and Energy Applications

Many industrial processes discharge HAPS (Hazardous Air Pollutants), VOCs (Volatile Organic Compounds) or odorous emissions, as well as particulates and acid gas.

MEGTEC provides a wide range of solutions.

- Wet Electrostatic Precipitator (WESP) Systems
- Semi-Dry and Wet Scrubbers
- Acid Gas Absorbers
- Spray Dryer Absorbers
- Selective Non-Catalytic Reduction (SNCR) Systems
- Evaporative Gas Cooling & Conditioning Systems
- Regenerative Thermal Oxidizers (RTO)
- Recuperative Thermal Oxidizers
- Regenerative Catalytic Oxidizers (RCO)
- Recuperative Catalytic Oxidizers
- Solvent Recovery Systems (Regenerative Carbon Adsorption)
- Non-Regenerable Adsorption Systems
- Distillation, Purification and Recovery Systems
- Bioscrubbers / Bioreactors
- Greenhouse Gas (GHG) Abatement
- Heat Recovery Systems
- Waste-to-Energy Systems
- Turnkey Services



Wet Electrostatic Precipitators

Oxidizers



Heat Recovery



Solvent Recovery & Distillation



SonicKleen™ Wet Electrostatic Precipitator (WESP)



The SonicKleen™ Wet Electrostatic Precipitator (WESP) removes submicron particulate, heavy metals, dioxins & furans, mists, and fumes from process gas streams.

The vertical down-flow, hexagonal tube design delivers a superior combination of removal efficiency, low maintenance, low pressure drop and small footprint.

Design Features and Performance Advantages

- Integrated systems, complete with gas quenching, sub-cooling, and absorption available
- Maintains performance during on-line flushing
- Effective gas flow distribution system designed for minimal maintenance
- Patented Hood Mist Eliminator eliminates droplet carryover and maintenance
- Hexagonal tube design is the preferred collecting electrode design – no tubesheet required to eliminate leakage
- SonicCharge™ rigid mast electrode generates the highest field intensity
- Superior high-voltage insulator compartment design maintains integrity of insulators and reduces maintenance
 - zero purge air system design available
 - online insulator access design available
- No moving parts
- Multiple collecting field designs can be used where applicable
- Upflow design where appropriate
- Construction can consist of a variety of materials able to withstand high temperatures, severe corrosion, and abrasion.

SonicKleen™ features can be retrofit into existing WESP installations to improve performance.



Scrubbers

TurboVenturi Scrubber

The TurboVenturi scrubber is a high-efficiency particulate removal device. Its design ensures constant pressure drop, which equates to constant removal efficiency.

The TurboVenturi's refined de-watering ability ensures virtually no liquid droplet carryover – a crucial advance in view of today's stringent requirements, where a small amount of liquid carryover can adversely affect emission test results or downstream equipment.

Advantages

- Particulate removal efficiency can be optimized by adjusting pressure drop.
- Different types of throat dampers can be provided to ensure constant pressure drop with fluctuating gas flows.
- Ideal for gas conditioning upstream of the SonicKleen™ WESP
- Efficient gas saturation and bulk removal of particulate
- TurboVenturi scrubbers can operate for years without shutdown.
- Different styles of TurboVenturi Scrubbers are available to suit a wide range of applications, including hot or corrosive gases and abrasive or sticky dust.

Acid Gas Absorbers

MEGTEC TurboSonic offers a range of gas absorption systems including open spray towers, tray towers, packed towers and Turbotak atomizing spray scrubbers to control SO_2 , HCl, ClO_2 , Cl_2 and other gas emissions.

Turbotak Wet Scrubber

For gas streams containing acid gas and particulate, the Turbotak Wet Scrubber, which uses Turbotak Atomizing Nozzles, controls these contaminants in one system with minimal pressure drop, lower water usage and less maintenance than other systems.

- Vertical and horizontal configurations available
- Easily retrofit into existing facilities

TurboSorb Spray Dryer Absorber

TurboSorb provides effective control of SO_2 and HCl by the injection of lime slurry. Achieve up to 90% reduction of SO_2 and 98% reduction of HCl, using microfine or standard lime.

Unlike wet scrubbers, all water is evaporated, with no liquid waste stream generated. The dry materials often can be recycled back into the product, avoiding the generation of a waste stream.



SNCR NO_x Control



SNCR DeNO_x Nozzles

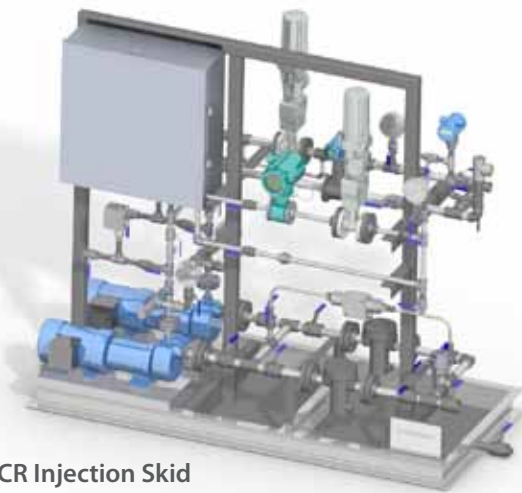
Nitrogen oxide (NO_x) emissions are effectively removed using MEGTEC TurboSonic's TurboNOx Selective Non Catalytic Reduction (SNCR) systems. Ammonia or urea solutions are injected directly into the hot gas, which breaks down to chemically reduce the NO_x to clean nitrogen gas and water.

TurboNOx systems feature our specially designed, high-efficiency, wear and plug-resistant Turbotak nozzles. Our systems are designed for optimal drop size and spray coverage to reduce NO_x, while saving on reagent consumption.

Precisely control the injection rate to meet removal requirements to as high as 90% reduction of NO_x, with minimal ammonia slip.

MEGTEC TurboSonic offers a complete scope of supply including:

- System design & engineering
- Nozzles & lances
- Unloading stations
- Handling equipment
- Tanks
- Scrubbers
- Pumping and transfer skids
- Mixing and dilution controls
- Headers
- Programming/PLCs
- Installation, startup, service and technical support



SNCR Injection Skid



Turbotak and SoniCore® Atomizing Nozzles

Used in hundreds of industrial applications, Turbotak and SoniCore® nozzles atomize liquids to fine (5 µm to 60 µm SMD) droplets. The air-atomized nozzles feature a proprietary, two-phase design for superior control over droplet size and spray distribution.

The combination of the small droplets, the distribution pattern and rugged construction make them ideal for a wide variety of applications, including evaporative gas cooling, spray drying, wet and semi-dry scrubbing, performance enhancement of air pollution control systems, dust suppression, as well as combustion and incineration. SonicBURN relies on specially designed Turbotak nozzles to atomize viscous, dirty, or mixed fuels into extremely fine droplets in combustion chambers for better combustion and increased production.

SoniCool™ Evaporative Cooling & Conditioning

Protect downstream equipment, enhance air pollution control performance, reduce gas volumes and increase production capacity using SoniCool™ Evaporative Gas Cooling & Conditioning systems.

Turbotak Atomizing Nozzles introduce a controlled amount of finely atomized water into the hot gas stream in order to reduce and/or maintain gas temperature. The water evaporates to complete dryness, while absorbing heat from the gasses, for free-flowing dust, zero liquid discharge, and minimal or no wall buildup.

Design Features and Performance Advantages

- Rapid cooling reduces size requirement of the cooling chamber/duct systems and air pollution control equipment
- Erosion and plug-resistant Turbotak nozzles significantly reduce maintenance costs and downtime
- High capacity single and multiple orifice atomizers reduce the number of nozzles/lances required
- Infinite turndown ratios maintain optimum temperature control
- Completely dry operation eliminates water carryover, refractory spalling, sludge buildup, and water pollution
- Pre-assembled modules reduce field wiring, piping, and installation costs
- Our proven design has been used in hundreds of installations

MEGTEC TurboSonic provides upgrades to existing systems, retrofit or new installations, supplying nozzles, controls, pumps, and cooling tower fabrication.



CLEANSWITCH® RTO

Two (2) CLEANSWITCH® 60,000 scfm RTO units



30,000 scfm



The CLEANSWITCH® Regenerative Thermal Oxidizer (RTO) gives simplicity and cost effectiveness in a 2-chamber, single vessel with 99+% VOC removal. With thermal efficiencies of up to 97%, the CLEANSWITCH® RTO provides exceptional operating economy. For many applications, the CLEANSWITCH® RTO will run in a self-sustaining mode; that is, no additional fuel is required to destroy VOCs and achieve clean air compliance.

Patented Switch Valve

The CLEANSWITCH® RTO takes its name from MEGTEC's patented switch valve that keeps cleaned air totally separate from dirty process exhaust. The valve utilizes a double-air seal and is the only moving part in the unit. The simple oscillating design promotes uniform air distribution and results in a maintenance-friendly unit.

The unique design of the CLEANSWITCH® RTO along with the switch valve virtually eliminates pressure spikes, resulting in a smooth flow transition between heat recovery chambers. The innovative design makes the CLEANSWITCH® RTO unit the best solution for pressure-sensitive processes.

Simple, Modular Design

Designed to reduce RTO complexity, the CLEANSWITCH® RTO provides cost benefits with its flexible, modular design. Units up to 65,000 SCFM are supplied skid-mounted for fast installation time. These units are 99% factory assembled for a simple and economical installation. A climate-controlled, skid-mounted control room is included for easy access to controls in any type of weather.

CLEANSWITCH®

Single Unit Flow Capacity:	15,000 to 100,000 SCFM
VOC Destruction Efficiency:	99+%
Thermal Efficiency:	95 - 97%
Autothermal Operation:	3-4% LEL
Turndown Ratio:	1:4 or higher with optional Recirculation
VOC Concentration:	Up to 25% LEL with optional Hot Side By-Pass

25,000 scfm



35,000 scfm



40,000 scfm



50,000 scfm



Design Features and Performance Advantages

- Proven design since 2000 with more than 300 installations
- VOC destruction efficiencies of 99+% to meet stringent regulatory codes
- Thermal efficiency up to 97% provides reduced operating fuel costs
- Single valve – non-contacting, non-wearing, positive sealing via high pressure air provides trouble-free operation, resulting in low maintenance costs
- Electric valve drive gives quiet operation and reliable performance in severe climate conditions
- Climate-controlled, skid mounted control room simplifies installation and improves access to the controls
- Smooth valve switching with negligible pressure fluctuation
- Factory pre-assembled, pre-wired and pre-tested to provide significant savings of time and money during installation and start-up
- Media chamber – positive separation of media beds without metal divider walls
- Ceramic media bake-out for removal of organic deposits
- Cost effective, engineered ceramic heat exchange media beds with low pressure drop leading to reduced electrical operating costs
- Optional secondary heat recovery by air, hot water, thermal oil, steam, electricity generation or adsorption cooling.
- Multiple fuel options such as natural gas, propane, butane, fuel oil and gaseous or liquid bio fuels
- Optional hot-side by-pass system for use in high solvent load applications

165,000 scfm total



MILLENNIUM® RTO



The MILLENNIUM® Regenerative Thermal Oxidizer (RTO) is an economical approach to clean air compliance incorporating two individual poppet valves in a 2-chamber, single vessel design. The unique, compact system meets the needs of a wide variety of applications while providing efficiency and reliability at an affordable capital investment.

- Highly reliable poppet-style valves, built in a common manifold, reducing initial capital investment, installation and maintenance costs
- Cost effective, robust ceramic heat exchange media with low resistance, which minimizes pressure drop for trouble-free operation and reduced electrical operating costs
- Optional hot-side bypass system for high solvent load applications
- Ceramic media bake-out cleaning for removal of organic deposits
- Multiple fuel options such as natural gas, propane, butane, fuel oil and gaseous or liquid bio fuels
- Thermal efficiency at 95-97%. Even at relatively low solvent concentrations, the system can sustain thermal operation with the heat released during VOC oxidation
- VOC destruction efficiencies of 98% as standard. Higher cleanup rates with an optional VOC capture system to meet stringent regulatory codes
- Optional secondary heat recovery system for air, hot water, thermal oil or steam, electricity generation or adsorption cooling
- Flexibility of installation whereby the units can be installed indoors, outside or on the roof
- Heavy-duty construction and reinforced enclosure ensure dependable service

MILLENNIUM®

Flow capacity:	4,000 to 15,000 SCFM
VOC destruction efficiency:	98-99%
Thermal efficiency:	95 to 97%
Autotherm operation:	3-4% LEL
Turndown ratios:	1:4 or higher with optional recirculation
VOC Concentration:	Up to 25% LEL with optional hot-side bypass

Heat Recovery & Process Energy Optimization for Thermal and Catalytic Oxidizers

MEGTEC has extensive experience in providing heat recovery systems to facilities around the world. Our engineers have an in-depth understanding of our customer processes, and can provide a system to recover excess energy in the exhaust stream direct from the process or oxidizer to optimize its efficiency and performance, and result in energy savings.

By upgrading older catalytic and thermal recuperative oxidizers, regenerative thermal oxidizers (RTOs) or direct-fired oxidizers, MEGTEC can help increase capacity and reduce operating costs.

The key to effective energy recovery is to identify the optimum sources of and uses for the energy and select the most cost-effective, efficient system to transport and deliver the energy.

Uses for recovered heat energy include:

- Process heating
- Combustion air heating
- Building makeup air heating systems
- Hot water systems (plant boiler loop)
- Low temperature steam applications

Process Energy Audits

MEGTEC offers energy audits to evaluate the performance of the oxidizer to ensure that it is operating efficiently and to identify energy-saving opportunities.



Integrated Heat Recovery System



Air-to-Air Heat Recovery

MEGTEC offers a wide range of solutions to fit the specific needs of their customers – whether a “prepackaged”, skid-mounted system or a custom designed, integrated heat recovery system. MEGTEC’s robust, skid-mounted heat recovery system is provided fully assembled and tested. Its small footprint provides an attractive return on investment, simple, fast installation, yet is fully automated for efficient operation.

Solvent Recovery by Carbon Adsorption



NMP Recovery at Electrode Battery Manufacturing Plant

Solvent Recovery at Pharmaceutical Plant



Skid-Mounted System

MEGTEC Solvent Recovery Systems are an economical solution to emission control and compliance with international and local emission standards. The solvent can be recovered and reused in the process providing a payback on the capital invested.

Solvent recovery offers an alternative to destruction technologies for VOC emission control especially where the quantity of solvents is large, the value of the solvents is high, or the solvents contain chlorine, bromine, fluorine or nitrogen as no secondary pollutants are produced.

MEGTEC supplies proprietary systems for high efficiency removal, recovery and purification of solvents from process exhaust air streams.

MEGTEC solvent recovery systems include steam regenerated carbon adsorption, chilled fluid condensation, and packed bed fluid scrubbing systems to remove and recover the solvents from the process stream.

MEGTEC typically provides small solvent recovery systems preassembled and skid-mounted for easy installation by its customers. Large solvent recovery systems are supplied as total turnkey projects, where MEGTEC assumes responsibility for the entire installation and start-up of the system.

Other applications of this regenerable adsorption technology are in the field of gas purification. MEGTEC provides systems to remove BTX from acid gas, and also for removing unwanted organics from process exhaust gases up stream of catalysts.

MEGTEC has provided units with air flows as large as 760,000 scfm. The modular design of the system allows for larger systems based on the air flow needs of the customer.

Solvent recovery and non-regenerable adsorbers can have a removal efficiency of >99.9%.

780,000 cfm Unit at Publication Gravure Plant



Non-Regenerable Adsorbers

In addition to the regenerable adsorption systems which offer solvent recovery, MEGTEC also designs and supplies non-regenerable adsorption systems to treat a wide range of applications in the vapor and liquid phases such as:

- Tank venting
- Odor control
- Downstream polishing of emissions
- Color removal in the liquid phase
- Gas purification
- Trace chemical removal in the gas and liquid phase

Distillation, Purification & Recovery

Following the recovery of solvents from the process exhaust stream, MEGTEC also provides distillation equipment to purify and separate the solvents suitable for reuse in the process.

The technology can also be supplied to treat stand-alone purification requirements, such as removal of organics from waste water and the drying of solvents.

Systems are generally supplied preassembled on skids for ease of equipment installation.

Pilot Distillation System

To aid in the understanding of difficult separations, MEGTEC operates a pilot distillation system that may be used to develop data and demonstrate separation requirements on a case-by-case basis when such data is not available. The column can be set up in multiple configurations to suit a particular feedstock and allows the generation of data with varying feed rates, reflux ratios and pressure or vacuum levels. Feed rates can range from 2 to 10 liters per hour depending on feedstock, and in most cases, a 20 to 40 liter feed sample is adequate to achieve the desired results.



Wastewater Treatment from Pharmaceutical Plant

NMP Recovery from Battery Electrode Manufacturing Plant



Heat Recovery & Process Energy Optimization for Solvent Recovery Systems



Heat Recovery Heat Exchanger



For use with solvent recovery systems, heat recovery can be supplied with the initial system or field retrofitted to an existing system. Comprised of a shell and tube heat exchanger system, it utilizes the heat of steam and vapor condensation to pre-heat boiler feed or utility water for building heating systems thereby effectively reducing energy costs.

Exhaust gas analyzer systems. An exhaust gas analyzer system can be retro-fitted to monitor the exhaust stack solvent concentrations from the solvent recovery system. The exhaust gas analyzer is tied into the solvent recovery control system and is designed to automatically initiate the steam regeneration cycle once a preset emission limit has been reached. The gas analyzer ensures that the adsorptive capacity of the solvent recovery system is fully utilized before a steam regeneration cycle is initiated, reducing overall steam consumption and energy costs.

Variable frequency drives. A Variable Frequency Drive (VFD) can reduce energy costs. It is used to automatically ramp a fan or pump motor up or down to suit variations in the process conditions to optimize electrical energy consumption.

Replacement carbon and carbon service. Over time, carbon can become less efficient through contamination, poisoning or attrition. This can impact carbon performance and lead to excess steam usage, higher pressure drop and higher energy costs. To combat this, MEGTEC offers a range of services including carbon sample testing, carbon screening services and replacement carbon.

Energy audit and system surveys. MEGTEC offers energy audits and system surveys to evaluate the performance of your solvent recovery system to ensure that it is operating efficiently and to identify energy-saving opportunities.

MEGTEC offers many types of heat recovery systems to reduce energy:

- Thermal oil systems
- Air-to-air heat exchangers
- Air-to-glycol systems
- Air-to-steam boiler systems
- Air-to-water systems
- Adsorption chiller units

Services

MEGTEC can rebuild or upgrade your oxidizer or process dryer to optimize its efficiency and performance, thereby reducing energy costs.

Ceramic media upgrades: Vintage RTOs may contain random-packed heat exchange media. The pressure drop associated with random-packed media is high when compared to structured media. By replacing this media with structured media, the pressure drop across the unit is reduced and it is easier to pass air through the oxidizer, resulting in increased flow capacity. It can also result in reduced electrical costs with the exhaust fan operating at a lower brake horsepower.

Heat exchanger repair or replacement: MEGTEC can supply cost effective direct replacement heat exchangers as well as customized units that address specific needs such as corrosive environments, thermal expansion or cleanability. Replacing a worn or damaged heat exchanger with a properly designed substitute will reduce operating and maintenance costs, extend the life of equipment, and ensure emission regulatory compliance.

Preventive Maintenance (PM) Services: gives you right-from-the-source expertise. Our factory-trained technicians are skilled in maintaining and upgrading your equipment.

MEGTEC's PM Program offers the best insurance against equipment breakdown and keeps your equipment running at optimum levels. Our PM service technician will look at ways you can save money by making annual adjustments and balances of dampers that will help reduce you energy costs. Ask us about our Energy Audit Program.

Additional Services include:

- Insulation/refractory rebuilds
- Controls/operator interface upgrades
- Burner upgrades
- Dampers/fans upgrades
- Motors and drives upgrades
- Project management
- Turnkey installation & equipment relocation
- Sampling & testing services of catalyst & media



Installation & Relocation Services



Media Replacement

Integrated RTO with DDGS Dryers, Cooler, Cyclones and Ductwork



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