The CMM Group

REGENERATIVE THERMAL OXIDIZERS (RTO)
CUSTOM-DESIGNED RECUPERATIVE OXIDIZERS
CATALYTIC OXIDIZERS

For Industrial Air Pollution Control

About The CMM Group

The CMM Group provides custom-designed air pollution control systems, industrial wastewater treatment systems, and aftermarket services to a wide variety of industries. Our mission is to support our customers with end-to-end lifetime support of their equipment.

Our Commitment

We are committed to supporting our customers from pre-project planning through post-installation lifetime of their equipment with our extensive aftermarket services capabilities regardless of original equipment manufacturer.

Our strengths show our commitment to our customers:

- Customer Responsive
- Broad Process Knowledge
- Attention to Detail
- Quality Name-Brand Components
- Custom Design and Fabrication
- Strong Project Management
- Complete Turnkey Installation Services
- On-time Completion of Projects
- Parts and Service Support for any OEM Brand
- Upgrades, Retrofits, Rebuilds
- Preventive Maintenance Programs

VOC CONTROL TECHNOLOGY SELECTION GUIDE

TECHNOLOGY	EQUIPMENT DESIGN & OPERATION	TYPICAL APPLICATIONS	TYPICAL ADVANTAGES & DISADVANTAGES
Catalytic Oxidizer	**Catalytic Oxidizers destroy air pollutants at temperatures ranging from 500°F to 650°F.** A high-efficiency counter-flow plate-type heat exchanger is used to preheat incoming exhaust fumes from the production process. Oxidation is achieved as pollutants pass through a bed of precious metal catalyst. The catalytic oxidizer internals are manufactured of stainless steel. Thermal efficiencies of 50 to 80% are available. 99% VOC/HAP destruction efficiency is typical.	• 2,500 to 30,000+ SCFM • Ideal for air streams with LFLs of ~4% to ~15% **Common uses include:** • Converting web dryers • Flexographic printing • Heat-set printing • Bakeries • Coffee roasting • Chemical processing	**Advantages:** • Low operating costs with low solvent concentrations • Low maintenance costs • Ease of operation • Ease of install **Disadvantages:** • Potential for catalyst poisons • Limited to maximum of ~20% LFL
Thermal Oxidizer (TO)	**Thermal Oxidizers (TO) destroy air pollutants at temperatures ranging from 1,400°F to 1,500°F.** Thermal Oxidizers (TO) utilize a multi-pass shell-and-tube type heat exchanger, which is fabricated of heavy-duty stainless steel. Oxidation is achieved as pollutants pass through the burner flame, are mixed and held at elevated temperatures in the combustion chamber for 0.5 to 1.0 seconds. The TO is internally insulated with ceramic fiber insulation. The external shell is carbon steel. Thermal efficiencies of 40 to 70% are available. 95-99%+ VOC/HAP destruction efficiency is typical.	• 2,500 to 40,000+ SCFM • Ideal for air streams with LFLs of ~15% to ~40% **Common uses include:** • Converting web dryers • Adhesive coating • Metal decorating • Heat-set printing • Pharmaceutical • Textile manufacturing	**Advantages:** • Moderate capital cost • Low operating costs with medium to high solvent concentrations • Ease of operation • Ease of install **Disadvantages:** • High operating costs with low solvent concentrations • Shell-and-tube heat exchanger has long life expectancy only with continuous operation
Regenerative Thermal Oxidizer (RTO)	**Regenerative Thermal Oxidizers (RTO) destroy air pollutants at temperatures ranging from 1,500°F to 1,800°F.** RTOs utilize ceramic media packed into vertical canisters as a high-efficiency heat exchanger. Oxidation is achieved as pollutants pass through the ceramic media, are mixed, and held at elevated temperatures in the combustion chamber for 0.5 seconds. The RTO is internally insulated with ceramic fiber insulation. The external shell is carbon steel; however, materials of construction can be tailored to meet customer requirements. Thermal efficiencies of 80 to 97% are available. 98%+ VOC/HAP destruction efficiency is typical.	• 2,500 to 100,000+ SCFM • Ideal for air streams with LFLs of ~3 to ~20% **Common uses include:** • Converting web dryers • Flexographic printing • Heat-set printing • Metal coil coating • Surface coating • Wood finishing • Wood products (OSB) • Fiberglass manufacturing • Chemical processing	**Advantages:** • Moderate capital cost • Low operating costs with low solvent concentrations • Very high thermal heat recovery • Capable of high inlet temperatures **Disadvantages:** • Two chamber design limited to ~98% air pollutant destruction • More moving parts more maintenance
Rotary Concentrator System	A Rotary Concentrator is a hybrid system. Polluted air passes through a rotating wheel where pollutants are adsorbed onto a hydrophobic Zeolite media. The wheel rotates slowly, passing a sector of the wheel with the adsorbed air pollutant through a desorption plenum for removal by a heated air stream, thus continuously returning a regenerated (or clean) sector back into the main housing for adsorption. Desorption is automated as the slipstream of air that was routed through the cooling plenum is sent through a supplemental desorption heater where it is elevated to desorption temperature (typically ~365°F) & returned to the concentrator housing. This heated desorption air is directed through the wheel via the desorption plenum were concentrated pollutants are removed. The highly concentrated air stream is routed to an oxidizer for destruction.	• 20,000 to 150,000+ SCFM • Ideal for air streams with LFLs of ~.25 to ~1.5% **Common uses include:** • Automotive coatings • Chemicals and paint manufacturing • Semi-conductor manufacturing • Surface coating • Wood finishing & manufacturing	**Advantages:** • Low operating costs with low solvent concentrations **Disadvantages:** • High capital cost • Design limited to ~96% air pollutant destruction • Limited to low inlet temperatures • Particulate must be filtered • More moving parts, more maintenance

Regenerative Thermal Oxidizer
(RTO)

Regenerative Thermal Oxidizers from The CMM Group are designed to destroy air pollutants emitted from process exhaust streams at temperatures ranging from 815°C (1,500 F) to 1010ºC (1850F). This VOC abatement technology utilizes ceramic media packed into vertical canisters as a high-efficiency heat exchanger. High temperature thermal oxidation is achieved as pollutants pass through the ceramic media, are mixed, and held at elevated temperatures in the combustion chamber.

RTO Typical Applications

- Chemical processing
- Converting web dryers
- Ethanol production
- Flexible packaging
- FRP manufacturing
- Heat-set printing
- Metal Coating
- Pharmaceutical manufacturing
- Paint & coatings manufacturing
- Surface coating
- Wood finishing & manufacturing

Highlights of CMM RTO

- High destruction efficiency at low operating costs
- Compact design allows for quick installation
- Customizable airflow capacity
- Robust design and simplified maintenance
- 1,600 to 102,000+ NCMH (1,000 to 60,000+ SCFM)

The basic design concept of thermal oxidization is to promote a chemical reaction of the air pollutant with oxygen at elevated temperatures. This reaction destroys the VOC emission in the air stream by converting it to CO2, H2O and heat. The rate of reaction is controlled by three-(3) interdependent and critical factors; time, temperature and turbulence. Air pollutant destruction efficiencies of 99% can typically be guaranteed.

CMM RTO Aftermarket Services

CMM provides expert support services to ensure minimal downtime and maximum efficiency of your RTO.

- PLC/HMI replacement
- Variable Frequency Drive (VFD) upgrade
- RTO insulation repair/replacement
- RTO media cleaning
- Preventive maintenance
- Spare and replacement parts
- Retrofits and relocation

How does it work?

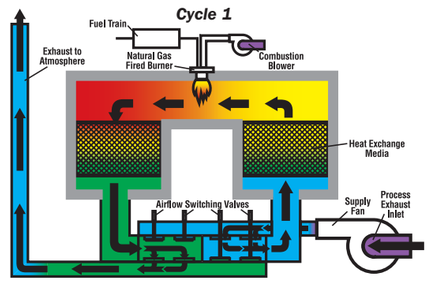
In operation, the process exhaust fumes are forced into the Regenerative Thermal Oxidizer inlet manifold (with a high-pressure supply fan) and directed into one of the energy recovery canisters by use of inlet (switch) valves. The pollutant laden air passes from the valve assembly vertically upward through the first of the heat exchanger canisters where it adsorbs heat from the ceramic media (thus eventually cooling the media).

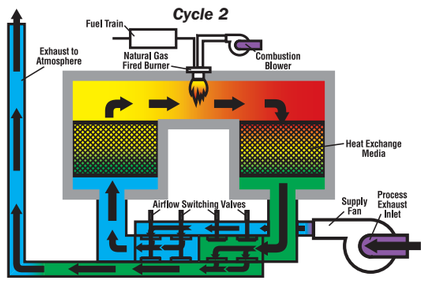
This preheated air then enters the combustion chamber (typically at a temperature very close to that required for oxidation), is thoroughly mixed for temperature uniformity (turbulence) and held in the combustion chamber at the elevated set-point temperature (temperature) for a residence time of ~0.5 seconds (time).

Air pollutant destruction takes place within the combustion chamber where auxiliary fuel is introduced if necessary.

After passing through the combustion chamber, the clean (hot) air is routed vertically downward through a second energy recovery canister where the heat generated during thermal oxidation is adsorbed by the ceramic media (thus preheating the media for the next cycle). The clean (cooled) air is routed to the atmosphere through outlet (switch) valves, the exhaust manifold and ultimately through the exhaust stack. To maximize the heat exchange, the switching valves alternate the airflow path between canisters to continuously regenerate the heat stored within the ceramic media. Thermal energy recovery (TER) efficiencies range from 85% to 97%. To maintain low external shell temperatures and minimize radiant heat loss, the combustion chamber is insulated with long-life ceramic fiber modules. The external shell is typically fabricated of carbon steel. Air pollutant destruction efficiencies of 99% can typically be guaranteed.

Regenerative Thermal Oxidizer (2 Can)
Airflow Diagram





Thermal Recuperative Oxidizer

Thermal Recuperative Oxidizers (TOs) from The CMM Group destroy air pollutants emitted from process exhaust streams at temperatures ranging from 760°C (1,400 F) to 815°C (1,500 F). Thermal Recuperative Oxidizers utilize a multi-pass shell-and-tube type heat exchanger, which is fabricated of heavy-duty stainless steel. Oxidation is achieved as pollutants pass through the combustion chamber, are mixed and held at elevated temperatures in the combustion chamber.

Recuperative Thermal Oxidizer – Typical Applications

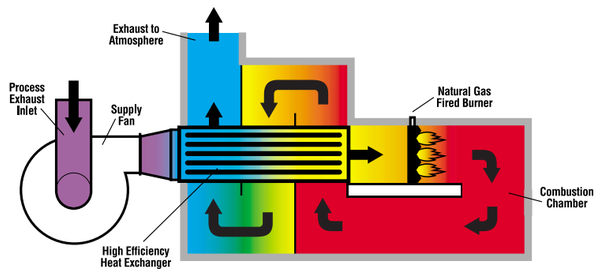
- Adhesive coating
- Chemical processing
- Converting web dryers
- Engine test facilities
- Ethanol production
- Heat-set printing
- Metal decorating
- Pharmaceutical manufacturing
- Textile manufacturing

Highlights of CMM Thermal Oxidizer

- Flexible design with optional heat exchanger
- Ideal for processes where silica is present in exhaust
- Simple operation with robust design
- •1,600 to 51,000+ NCMH (1,000 to 30,000+ SCFM)

The basic design concept of thermal oxidation is to promote a chemical reaction of the air pollutant with oxygen at elevated temperatures. This reaction destroys the VOC emission in the air stream by converting it to CO2, H2O and heat. The rate of reaction is controlled by the factors of time, temperature and turbulence. Air pollutant destruction efficiencies of 99%+ can typically be guaranteed.

Thermal Recuperative Oxidizer
Airflow Diagram



How does it work?

In operation, the process exhaust fumes are forced into the recuperative oxidizer inlet manifold (with a high-pressure supply fan) and directed into the cold (tube) side of a high efficiency, stainless steel, multi-pass shell-and-tube type heat exchanger. The pollutant laden air passes through the combustion chamber, is thoroughly mixed for temperature uniformity (turbulence) and held at the elevated set-point temperature (temperature) for a residence time of 0.5 to 1.0 seconds (time). VOC/HAP emission control takes place within the combustion chamber where auxiliary fuel is introduced if necessary.

Recuperative Thermal Oxidizer Efficiency

After passing through the combustion chamber, the clean (hot) air is routed back through the hot (shell) side of the heat exchanger where it continuously preheats the incoming air. Upon exiting the heat exchanger, the clean (cooled) air is routed through an exhaust chamber and ultimately through the exhaust stack. Heat exchangers for use in standard thermal recuperative units are typically fabricated from heavy duty stainless steel. Thermal efficiencies range from 40% to 80% with expansion joints as required. To maintain low external shell temperatures and minimize radiant heat loss, the unit is internally insulated with long-life ceramic fiber modules. The external shell is made of carbon steel.

Catalytic Oxidizers

Catalytic Oxidizers from The CMM Group are designed to destroy air pollutants and volatile organic compounds in air from process exhaust streams at temperatures ranging from 260°C (500°F) to 345°C (650°F). Catalytic oxidizers utilize a high-efficiency counter-flow plate type heat exchanger. Oxidation is achieved as VOC emissions pass through a heated bed of precious metal catalyst.

The basic design concept of catalytic oxidation is to utilize an industrial grade catalyst to promote the chemical reaction at lower temperatures as compared to thermal oxidation. The air pollutant is mixed with oxygen, heated to an elevated temperature and passed through a catalyst, thus destroying the pollutant in the air stream by converting it to CO2, H2O and heat. The rate of reaction is controlled by the temperature of the catalyst chamber and the amount of time that the pollutant spends within the catalyst itself. Catalytic oxidation commonly requires less energy to operate due to lower operating temperatures. Air pollutant destruction efficiencies of 99% can typically be guaranteed.

Catalytic Oxidizer – Typical Applications

- Converting web dryers
- Chemical processing
- Engine test facilities
- Food manufacturing
- Flexible packaging
- Heat-set printing
- Pharmaceutical manufacturing

Highlights of CMM Catalytic Oxidizer

- Low Operating Costs
- Small Footprint – Allows for Flexible Installations
- Ease of Operation
- Robust Design and Simplified Maintenance
- 1,600 to 51,000+ NCMH
- (1,000 to 30,000+ SCFM)

Catalytic Oxidizer Services

CMM provides expert catalytic thermal oxidizer support services to ensure minimal downtime and maximum efficiency of your equipment.

- PLC/HMI replacement
- Variable Frequency Drive (VFD) upgrade
- Oxidizer insulation repair/replacement
- Oxidizer media cleaning
- Preventive maintenance
- Spare and replacement parts
- Retrofits and relocation

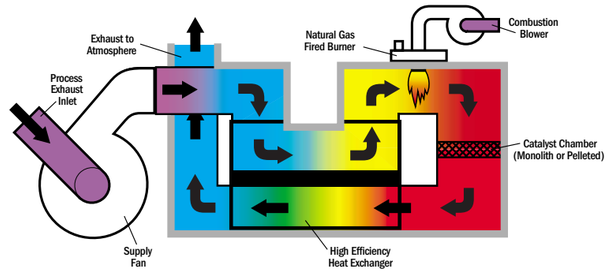
How does it work?

During operation, the process exhaust fumes are forced into the catalytic oxidizer inlet plenum (using a high pressure supply fan) and directed through the "cold" side of a high-efficiency, counter-flow plate type heat exchanger.

The VOC/HAP laden air then enters into the combustion chamber (typically at a temperature very close to that required for oxidation) where it is thoroughly mixed for temperature uniformity. To maintain set point temperature, auxiliary fuel is introduced if necessary. The preheated stream then passes through a fixed bed of industrial grade catalyst where air pollutant destruction takes place.

After passing through the catalyst chamber, the clean (hot) air is routed back through the "hot" side of the heat exchanger where it continuously preheats the incoming process air. Upon exiting the heat exchanger, the clean (cooled) air is routed to the atmosphere through an exhaust chamber and ultimately through the exhaust stack. Heat exchangers in standard catalytic units are typically fabricated of heavy-duty stainless steel. Thermal recovery efficiencies (TRE) range from 50% to 80%. Internal chambers of a catalytic oxidizer are manufactured entirely of heavy gauge stainless steel. Thermal expansion joints are incorporated where necessary. To maintain low external shell temperatures and minimize radiant heat loss, the internal chambers are covered with blanket insulation and then clad, typically with embossed aluminum.

Catalytic Oxidizer
Airflow Diagram



Rotary Concentrator
VOC Abatement System

Rotary concentrator thermal oxidizers from The CMM Group are hybrid VOC abatement systems designed to efficiently remove and destroy volatile organic compound emissions from a process exhaust air stream. The polluted air passes through a rotating wheel where the air pollutants are adsorbed onto a hydrophobic Zeolite media and then removed and destroyed by use of a thermal oxidizer.

During operation, air pollutants, captured from the process via a ductwork collection system, are passed through a high-efficiency filter as particulates can damage the concentrator wheel media. Once filtered, the polluted air passes through the rotating concentrator wheel where the air pollutants are adsorbed onto the hydrophobic Zeolite media. A slipstream of this air, approximately 10%, is routed through a cooling plenum while the remainder is routed directly to the common exhaust stack.

The rotor itself is fabricated from a corrugated mineral fiber substrate to which the manufacturer permanently bonds a proprietary mixture of hydrophobic Zeolite and inorganic materials. The hydrophobic Zeolite rotor concentrator wheel is inorganic and completely inert, has rigidity, physical integrity and the ability to withstand thermal stress. In this application the Zeolite removes the air pollutant from the manufacturing process exhaust air stream as it passes through the rotor.

Rotary Concentrator – Typical Applications

- Chemical processing
- Engine test facilities
- FRP manufacturing
- Paint & coatings manufacturing
- Pharmaceutical manufacturing
- Semiconductor manufacturing
- Surface coating
- Wood finishing

Highlights of a CMM Rotary Concentrator

- Ideal for large airflows with low VOC loading
- Reduced operating costs
- Flexible oxidizer pairing options
- 34,000 to 255,000+ NCMH, 20,000 to 150,000+ SCFM

Concentrator Thermal Oxidizer Services

The CMM Group offers expert thermal oxidizer support services for projects of all sizes. We offer services for new and existing equipment, including:

- Rebuilds & Upgrades: improve equipment performance and productivity
- Maintenance: minimize downtime and maximize efficiency with our preventative services
- Installation & Relocation: from contractor supervision to turnkey installation
- Technical Services: consulting, site engineering, manufacturing, turnkey installation
- Permanent Total Enclosures: increase VOC concentration to your thermal oxidizer

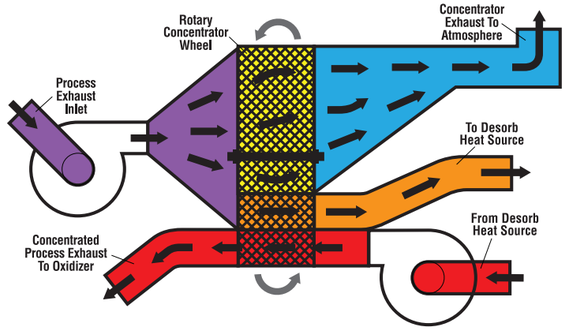
How does it work?

During operation, the process exhaust fumes are forced into the catalytic oxidizer inlet plenum (using a high pressure supply fan) and directed through the "cold" side of a high-efficiency, counter-flow plate type heat exchanger.

The VOC/HAP laden air then enters into the combustion chamber (typically at a temperature very close to that required for oxidation) where it is thoroughly mixed for temperature uniformity. To maintain set point temperature, auxiliary fuel is introduced if necessary. The preheated stream then passes through a fixed bed of industrial grade catalyst where air pollutant destruction takes place.

After passing through the catalyst chamber, the clean (hot) air is routed back through the "hot" side of the heat exchanger where it continuously preheats the incoming process air. Upon exiting the heat exchanger, the clean (cooled) air is routed to the atmosphere through an exhaust chamber and ultimately through the exhaust stack. Heat exchangers in standard catalytic units are typically fabricated of heavy-duty stainless steel. Thermal recovery efficiencies (TRE) range from 50% to 80%. Internal chambers of a catalytic oxidizer are manufactured entirely of heavy gauge stainless steel. Thermal expansion joints are incorporated where necessary. To maintain low external shell temperatures and minimize radiant heat loss, the internal chambers are covered with blanket insulation and then clad, typically with embossed aluminum.

Rotary Concentrator
Airflow Diagram



The CMM Group

Request a Quote from The CMM Group

We invite you to contact us to discuss the best technology for your specific needs. Our technical team can assist in selecting the right technology for your application.

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