

Product Information
Air Cleaner for Poultry

- Ammonia reduced by 80% on average
- Maximum ammonia reduction from start-up
- Dust reduction
- Non-clogging filters
- Efficient droplet separators
- Droplets separators can be slide out and washed outside
- Easy maintenance
- User friendly
- Easy to install
- Corrosion resistant material



Air Cleaner for Poultry

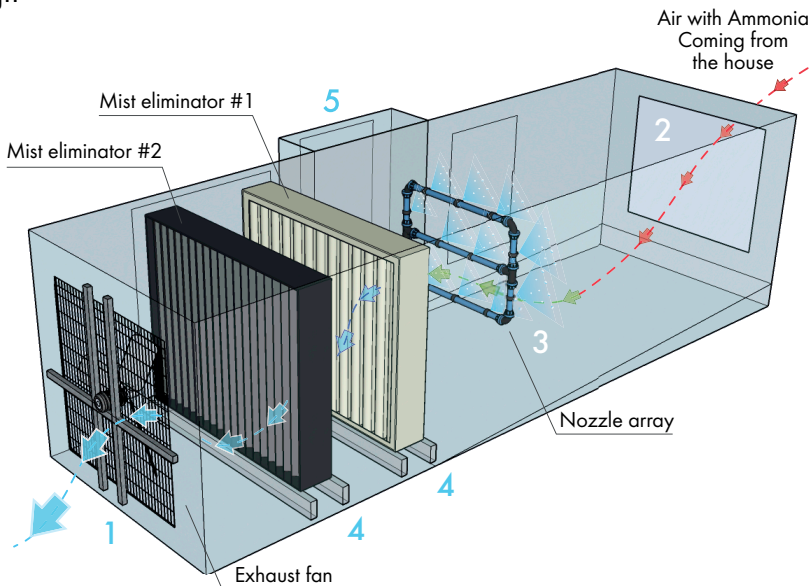
Ammonia is a natural residual product from livestock production and because of environmental regulations many farmers are facing limits for ammonia emission – especially when they increase their animal production. In order to make it possible for farmers to enlarge their production in areas with ammonia restrictions, Munters has developed air cleaners.

The Munters Air Cleaner (MAC) was designed to deal with the unique environmental challenges offered by cleaning exhaust air from a poultry building. Such air contains a heavy load of sticky dust, which is very difficult to remove from the air stream and sticks to all elements of the air cleaner. The MAC features a droplet separator that can handle such conditions and which is easily accessible and removable for periodic cleaning. This innovative design reduces ammonia emission by more than 80% and was also awarded with the Agromek Prize in 2012 for its user friendly cleaning system.



Air Cleaner for Poultry

Design



The air cleaner consists of a long box. In one end of the box is a fan (1), which extracts air from the building (2) through the box. In the air cleaner is a nozzle array (3), which sprinkles droplets consisting of a mixture of water and sulphuric acid. When the extracted air containing ammonia passes over the droplets, the ammonia molecules in the air react with the liquid. The droplets fall to the bottom of the box or are collected by the droplet separators (4) and led to the bottom of the box. Thus the ammonia is separated from the ventilation air before the air is released to the surroundings.

On one side of the box is a technical cabinet (5). The technical cabinet consist of a controller, a pump which circulates the liquid between the bottom of the box and the nozzles and a dosing pump which adds acid to maintain a constant pH level in the liquid. In the bottom of the air cleaner is a bilge, which pumps liquid to a storage tank. The separated liquid can be used as a fertilizer on the field.

The air cleaner is distinguished by high ammonia reduction and that it doesn't have any filters. Compared to conventional filters the droplet separators are easy to clean. Another advantage is that the droplet separator can be pulled out of the box and washed from outside with a traditional high pressure cleaner. This provides a good working environment and easy maintenance. The air cleaner is simply built, with the phrase "Keep it simple" been used during the whole development process.

Partial air cleaning

By using a MAC it is not necessary to clean all the air from a poultry house. In many climate zones in the world, there is a huge variation in outdoor temperature during the year. Typically the livestock housing units are cooled by outside air, which results in a much lower ventilation rate in the house during winter compared to the summer period. In contrast to the yearly differences in ventilation rate, the variation of the ammonia evaporation in the housing unit during the year is negligible.

In Denmark the ventilation rate is less than 20% of the maximum capacity for more than 40% of the time during a year. That means, if an air cleaner is able to clean the first 20% of the maximum ventilation capacity, then 100 % of the ventilated air is cleaned during 40% of the hours in a year. Additionally the air cleaner will clean 20% of the maximum ventilation capacity rest of the year.

An example - A MAC connected to a layer house in Denmark with 13,000 birds and a room temperature of 21 °C will have 20% partial air cleaning. The first 20% of the air will go through the air cleaner and get cleaned with an efficiency of 80%. The rest of the air will leave the house uncleaned through traditional exhaust fans. During a year the ammonia emission will be reduced by 58% and more than 2,000 kg of ammonia will be collected and available as fertilizer.

- Efficiency:
80% ammonia reduction in average for 4-80 ppm before air cleaner.

- Flow:
25.000 m³/hour at 40 Pa.

- Plug and play:
As soon as the air cleaner is started the maximum ammonia reduction will be achieved. No biological material needs to form. You can, for instance, wait until day 10 to start the air cleaner, as the ammonia emission in the beginning of a production cycle is limited.

- Keep it simple:
The MAC has a simple design which is an advantage according to maintenance and service.

- No filters:
The ammonia is captured by droplets suspended in the air stream.

- Extraction system:
Droplet separators can be drawn out and washed from outside.

- MAC connected to a layer house with 13,000 birds:
 - 20% partial air cleaning;
 - 80% ammonia reduction through air cleaner;
 - 58% ammonia reduction from layer house;
 - 2,000 kg ammonia captured.

Zeolite Rotor Concentrators



Leading the World in VOC Abatement

Munters Zeol Rotor Concentrator Systems are the leading technology for abatement of volatile organic compounds (VOCs). With more than 150 systems currently in service, our installed base includes some of the world's most respected companies. Munters Zeol systems are known for their cost-effectiveness, reliability, low maintenance design and durability. Systems are engineered, manufactured and tested in our ISO 9001 certified Massachusetts manufacturing center. Shipped worldwide, they are supported by our international service organization.

Sixty Years of Excellence and Innovation

With the combination of breakthrough zeolite research and time-tested Munters rotor technology, the systems have introduced a new level of efficiency and effectiveness to VOC abatement. Continuous research and engineering has lead Munters to its current dominant position in the field.

Munters pioneered rotor technology 60 years ago. Since then, over 30,000 rotors have been used around the world.



Munters Zeol is a division of Munters Corporation, a sixty year old air treatment technology company, headquartered in Stockholm, Sweden. The company's founder, Carl Munters, was a renowned 20th century inventor who many consider the "Edison of Sweden." Among his accomplishments were the development of the first home refrigerator and the substance now marketed widely as "Styrofoam." Before his death in 1989, Munters had earned nearly 1000 patents.

The company that now bears his name has operations on six continents. Munters began its American operations in the 1950s, manufacturing products for humidification and dehumidification. Since then, Munters has grown to be the worldwide market leader in air treatment technologies.

Today, our lives are impacted by Munters technology in a myriad of ways. Our products fight pollution, speed manufacturing, improve building comfort, increase agricultural production and help people recover from disasters. In each case, Munters products improve or control the quality of air. Our success is based on leadership, technology, solutions-oriented engineering and a dedication to product quality.



Carl Munters (1897-1989) was a successful Swedish inventor and entrepreneur.



Munters is the only company in the world manufacturing complete rotor concentrator abatement systems. Turnkey systems are manufactured at our Amesbury, Massachusetts facility.



Choose a Munters Zeol System

Unparalleled Experience

Munters is the industry leader in zeolite rotor concentrator systems having hundreds of installed systems. We pioneered the commercial use of zeolite for adsorption of VOCs.

Rotor Technology and Production

All engineering and manufacturing activities take place in our ISO 9001 certified factory. This is the only facility in the world that controls all aspects of rotor concentrator system manufacturing including the HoneyCombe® rotor structure and assembly of complete VOC abatement systems. We continuously work on product improvements and advancements in zeolite rotor technology.

Low Cost of Ownership

Munters concentrator systems have lower operating costs than RTOs and recuperative oxidizers. Less natural gas is required, and the low pressure drop across the system equates to smaller fans and lower electrical costs.

Reliability

Munters systems are engineered to operate continuously. Maintenance downtime is one day per year allowing customers to maximize production.

Turnkey Systems

Munters turnkey solutions include system design, installation services, project management, construction supervision and commissioning.

Engineered Retrofits

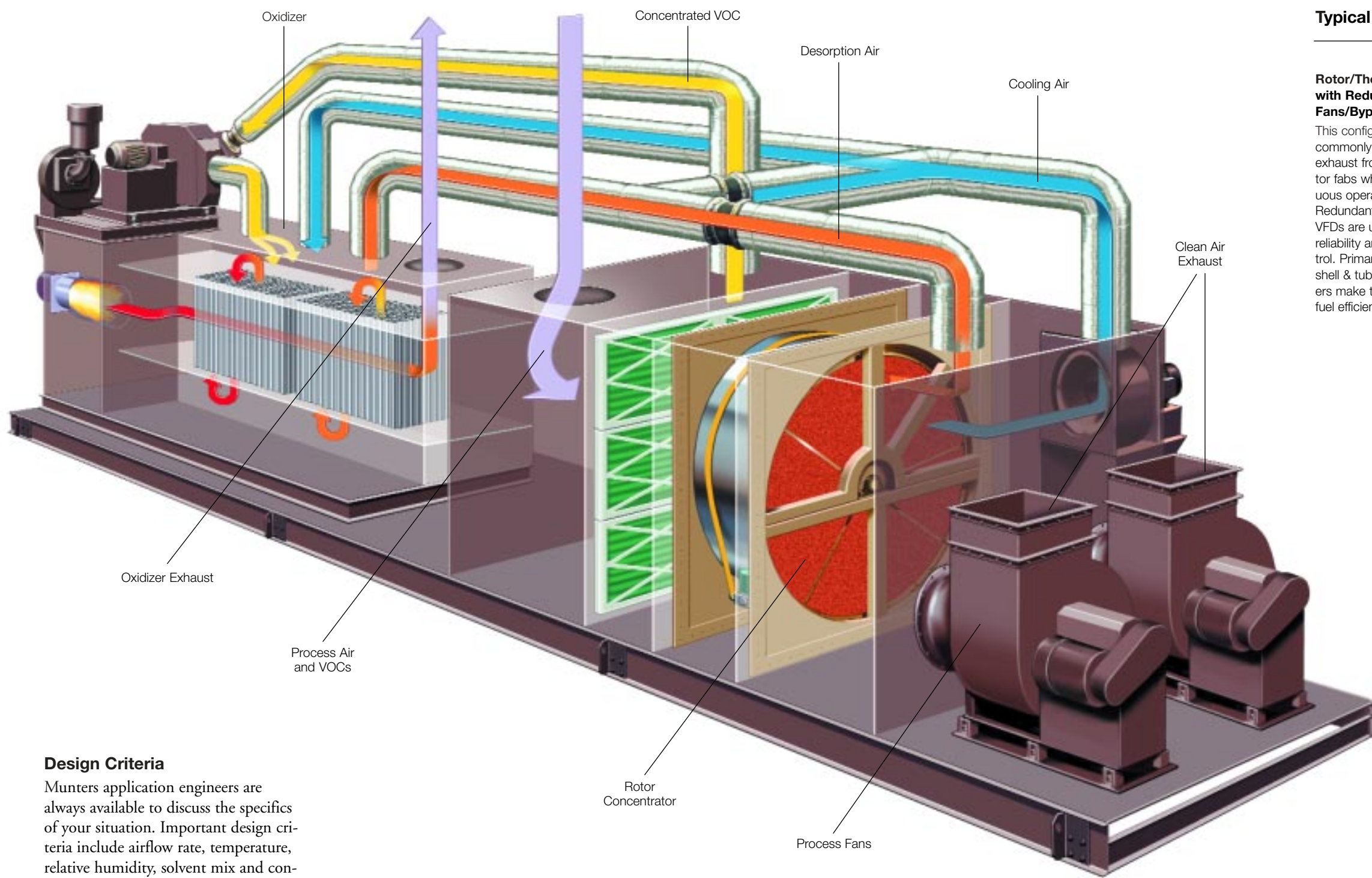
Munters can retrofit your existing system to increase capacity, improve performance and greatly reduce energy consumption. We also custom fabricate zeolite blocks for replacement of carbon rotor systems.

Modular Design

Munters systems are factory pre-wired, skid mounted and factory tested ready for installation and startup. Our modular design provides flexible configurations and minimizes lead time.

Worldwide Service

Munters service division offers comprehensive preventive maintenance programs. Our highly trained service personnel are available 24 hours a day worldwide.



Design Criteria

Munters application engineers are always available to discuss the specifics of your situation. Important design criteria include airflow rate, temperature, relative humidity, solvent mix and concentration. The following guidelines apply for a typical application:

- Solvent concentration of less than 500 ppm.
- Ambient temperature less than 120°F.
- Relative humidity less than 90%.
- Solvents with boiling points greater than 100°F.

To discuss your application with a Munters engineer, call 1-800-843-5360.

| ROTOR MODEL | NOMINAL FLOW (CFM) | WIDTH | HEIGHT | LENGTH | WEIGHT |
|-------------|--------------------|-------|--------|--------|------------|
| IZS-1146 | 3,000 | 8'6" | 8'6" | 25' | 12,000 lbs |
| IZS-1546 | 7,000 | 9'6" | 9'6" | 32' | 21,000 lbs |
| IZS-1946 | 10,000 | 10' | 12' | 34' | 28,000 lbs |
| IZS-2446 | 15,000 | 11' | 12'6" | 36' | 30,000 lbs |
| IZS-2946 | 25,000 | 12' | 13'6" | 38' | 40,000 lbs |
| IZS-3546 | 35,000 | 12'6" | 15' | 40' | 42,000 lbs |
| IZS-4246 | 60,000 | 14'6" | 16' | 45' | 45,000 lbs |

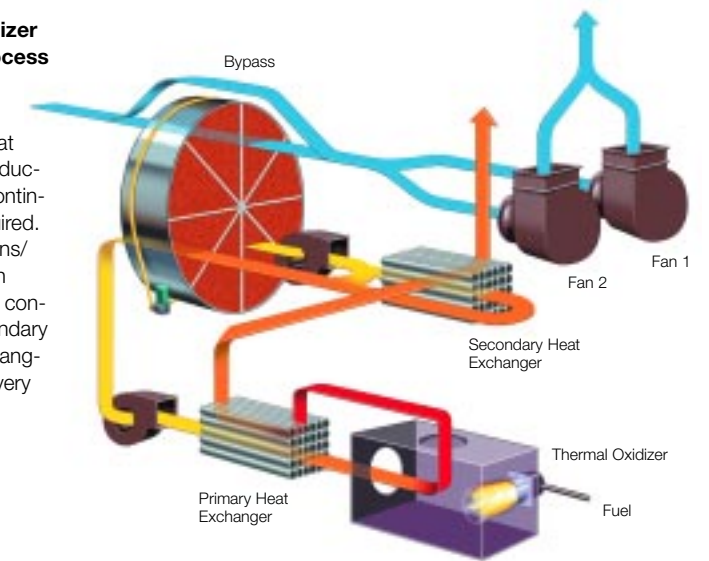
Munters will design a system to meet customer specific requirements. Options to choose from include:

- System Bypass
- Redundant Fans
- Insulated Plenums
- Particulate Pre-Filters
- Pressure Control
- Induced or Forced Draft Fans
- Heat Exchangers
- Pre-Conditioning Process Air (i.e., temperature, humidity)
- Fire Protection
- Materials of Construction (Aluminum or Stainless)
- Continuous Emissions Monitoring
- Remote Monitoring
- Flexible Control Packages
- Exhaust Stacks
- Seismic Restraints
- Vibration Isolation

Typical Configurations

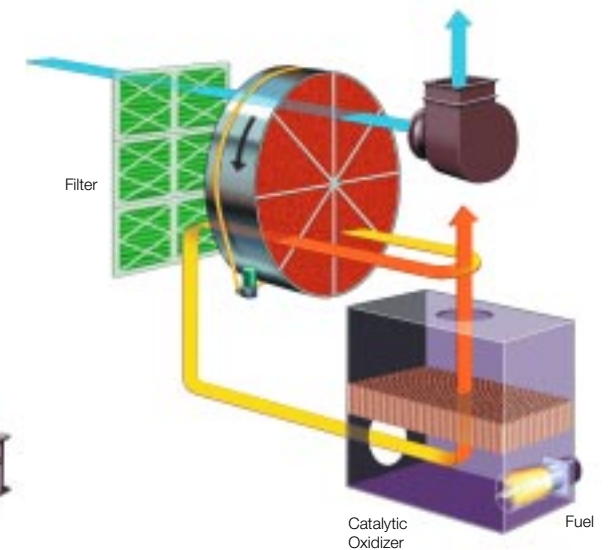
Rotor/Thermal Oxidizer with Redundant Process Fans/Bypass

This configuration is commonly used to treat exhaust from semiconductor fabs where 24/7 continuous operation is required. Redundant process fans/VFDs are used for high reliability and pressure control. Primary and secondary shell & tube heat exchangers make the system very fuel efficient.



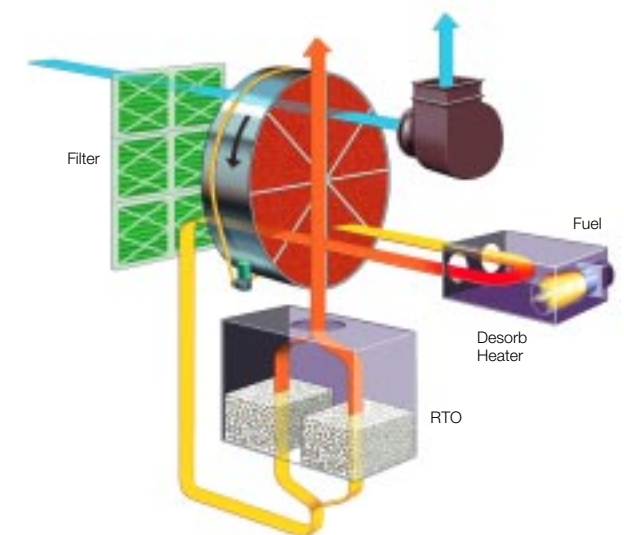
Rotor/Catalytic Oxidizer with Pre-Filters

This configuration is used to treat exhausts containing large amounts of solids and low concentration VOCs. For paint finishing applications, pre-filters can be used to filter solids before the zeolite rotor. An integrated catalytic oxidizer is used with high energy efficiency to destroy concentrated VOCs.



Rotor/RTO with Desorption Heater

Large airflow applications for automotive and aerospace finishing can be abated most cost-effectively by taking advantage of the concentrator technology and fuel efficient regenerative thermal oxidation.



How the System Works

Solvent laden air is drawn through the HoneyCombe rotor where VOCs are removed from the airstream by adsorption onto the hydrophobic zeolite. After passing through the rotor, the cleaned air is discharged into the atmosphere.

The Zeol rotor turns continuously (1-6 rph) transporting adsorbed VOCs into a regeneration zone. There, the VOCs are removed by a small heated air stream that is 5-10% of the process air volume. The regenerated zeolite is then rotated back into the process air stream.

The concentrate is typically sent to a small oxidizer where the VOCs are converted to water vapor and CO₂. The energy content of the VOCs contributes to the oxidation process further reducing the fuel requirement.

Heat exchangers are used to pre-heat the concentrate and provide the required heat needed to desorb the rotor and create additional fuel efficiency.

Hydrophobic Zeolites

Munters proprietary zeolite offers several characteristics that are ideal for VOC abatement.

Hydrophobic Properties

Munters zeolite is made hydrophobic using a chemical process that replaces the aluminum in the crystal with silicon atoms. Since it repels water, it is unlike any other zeolite, synthetic or natural. This property allows the zeolite to use all of its pores to attract and hold VOC molecules from an air stream.

Non-flammable Properties

As an inert and stable inorganic crystal, it does not react with organic materials or exhibit catalytic properties. This allows use of high temperatures for desorption of high boiling compounds and eliminates the safety risk associated with carbon adsorbers.

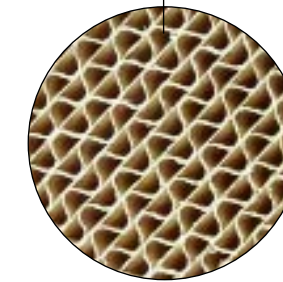
Pore Sizes

Zeolite pore size determines which molecule the zeolite will attract. Munters uses a proprietary mixture of zeolites with pore sizes to cover a wide range of organic solvents.

Adsorptive Capacity

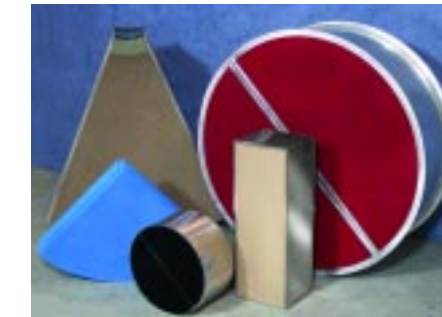
At low inlet VOC concentrations, zeolite has a higher capacity to adsorb VOCs than comparative technologies. (see Chart A)

At high relative humidities, zeolite adsorbs less water than carbon (see Chart B) leaving more sites for adsorption of organic molecules. Carbon experiences loss of adsorbent efficiency at 50% RH, whereas Munters zeolite remains efficient up to 90% relative humidity.



Advanced Rotor Design

Zeolite HoneyCombe rotors are manufactured from a corrugated mineral fiber substrate treated with a proprietary zeolite and other inorganic materials to provide physical integrity, rigidity and enough flexibility to withstand thermal stress. The HoneyCombe rotor, capable of withstanding 1,100°F is not affected by corrosive substances such as strong acid and is not blocked by high boiling solvents, particulates or resinous materials. Air flow through the flutes is uniform and of low velocity, resulting in very low pressure drop (less than 1.5" w.c.). It has continuous operation, non-fluctuating outlet conditions with no adsorbent attrition and few moving parts. The rotor has low friction contact seals to prevent leakage.



Munters custom fabricates replacement zeolite blocks for any existing carbon or zeolite concentrator system. The drive motor is explosion proof, inverter duty, UL listed and can be manually adjusted with a speed controller.

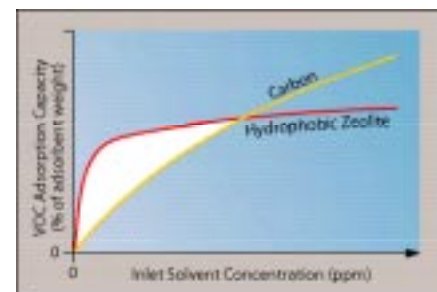
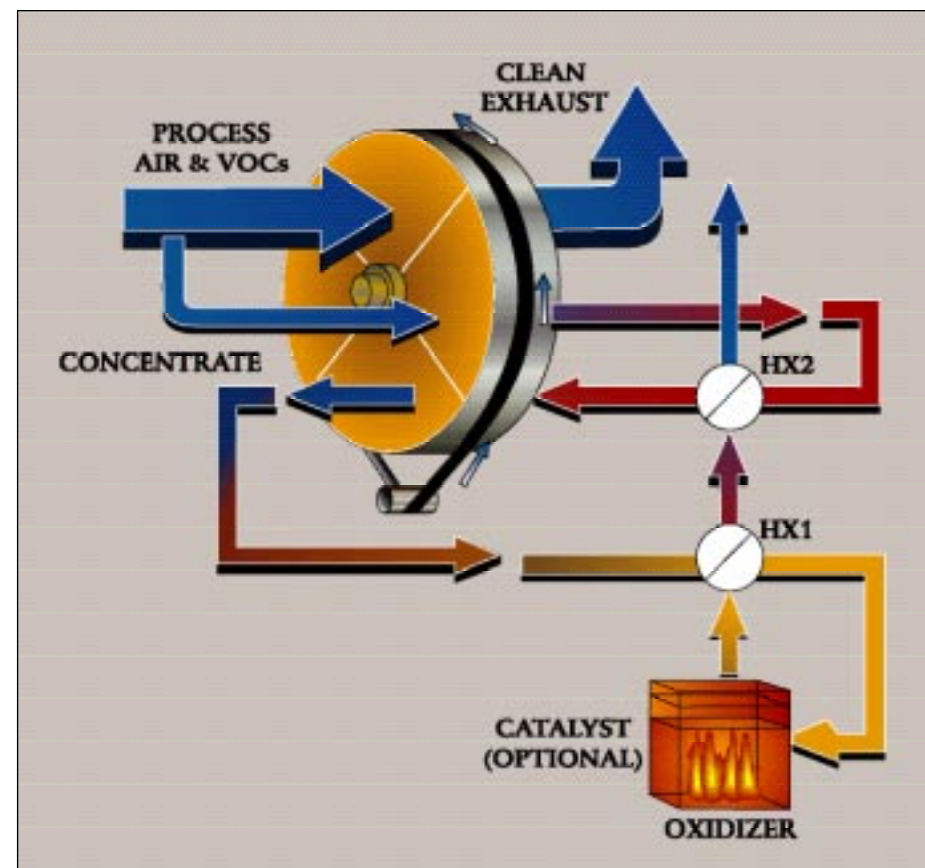


Chart A: At low concentrations, Munters zeolite's adsorption capacity exceeds that of carbon.

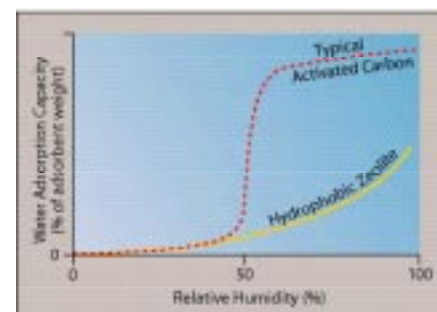


Chart B: Munters zeolite adsorbs far less water than carbon, even at high relative humidities.

Worldwide Service

Munters Service is dedicated to helping our customer optimize the value of their equipment through planned maintenance programs. Drawing from 60 years of experience as the leading manufacturer of air treatment technology, Munters has developed service programs that extend the life of our equipment, optimize its performance and assure continuous operation. As a result, our Service Department will support the installation of a Munters Zeol system in five important ways:

Factory Service Organization

Our technicians know your equipment comprehensively and can guide you with current technical information, perform complete maintenance services, or troubleshoot any problem. Service technicians are based near your facilities and certified through rigorous training programs. For international customers, we offer service technicians based on five continents.

24 Hour Emergency Service 1-800-843-5360

We can dispatch emergency service crews, provide troubleshooting by phone, or run diagnostics by dial-up connection.

ServiceCaire Maintenance Programs

Field experience has repeatedly shown that customers who employ planned maintenance can substantially extend their equipment life. By eliminating failures before they can occur, customers maximize both the utilization of Munters equipment and also lower the overall cost of ownership. The program includes a pre-determined number of visits and defined scope of work for specified equipment, or custom programs can be tailored to specific needs.

Replacement Parts Support

Replacement parts are inventoried at our Massachusetts manufacturing facility. In most cases, we can ship the part you need the same day you call.

Start Up Programs

Munters startup service ensures that equipment has been installed properly and is commissioned to operate according to specifications. It allows the customer to receive appropriate maintenance guidance and training for their particular installation.



Munters technicians are factory trained and available 24 hours a day to support your equipment.

Industrial Applications

With over 100 successful installations in many different industrial applications, Munters designs abatement systems to meet the individual needs of our customers. Our experience allows Munters to design optimal solutions for any application. Typical applications are:

- Paint Finishing
- Coating Operations
- Wood Finishing
- Semiconductor Manufacturing
- Electronics Manufacturing
- Printing
- Flexible Packaging
- Styrene/Composites
- Paint Manufacturing
- Chemical Processing
- Pharmaceutical Manufacturing
- Ground Water Remediation
- Investment Casting
- Pulp & Paper



Munters Zeol systems have been installed around the world since 1986. Shown above are installations at semiconductor plants in Massachusetts and California, and an automotive parts manufacturing facility in Michigan.