Munters

Zeolite rotor concentrator systems for VOC abatement

Munters ZEOL

The global leader in VOC abatement systems

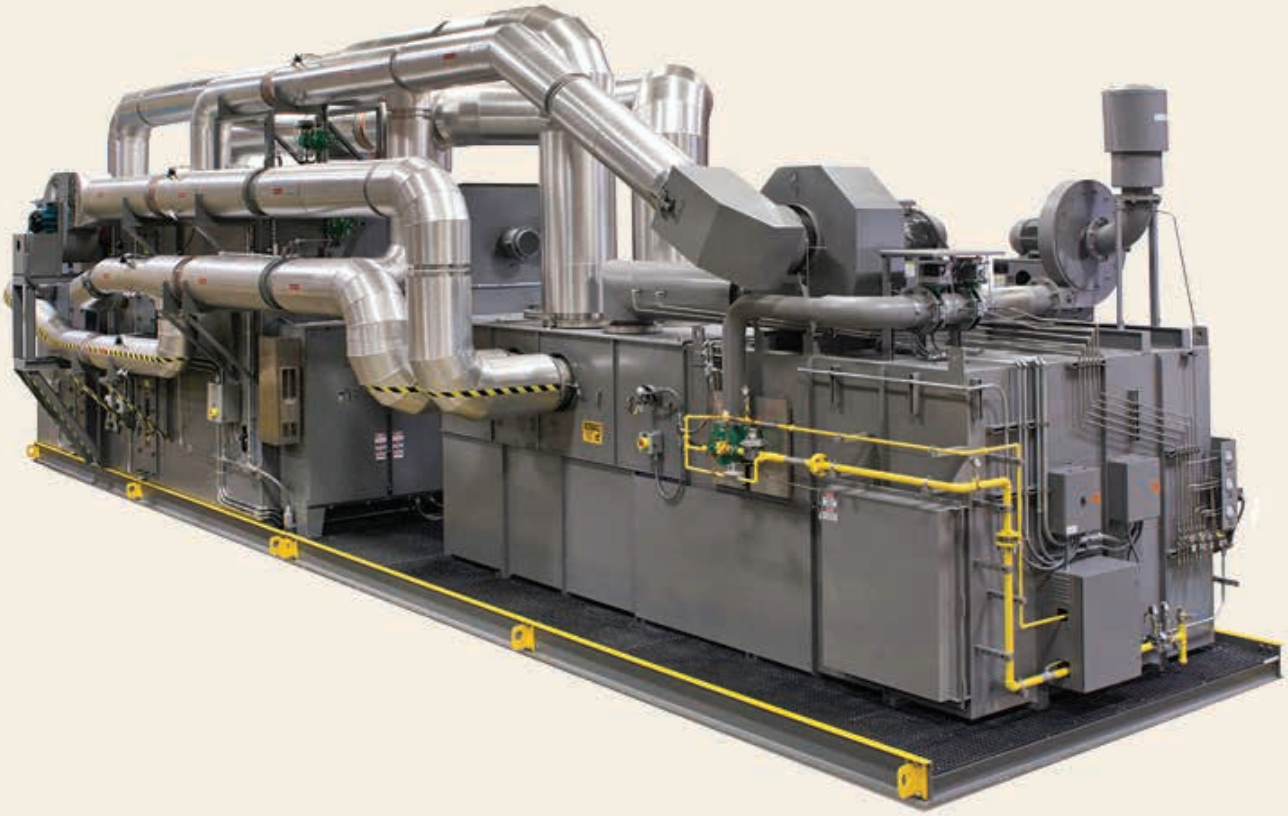
Volatile Organic Compounds (VOCs) are common pollutants in both indoor and outdoor air and can be especially problematic in industrial settings. Indoors, VOCs are irritating to the nose, throat and eyes. Many are carcinogenic. Outdoors, VOCs react with the oxygen molecules in nitrogen oxides (NO_x) and carbon monoxide (CO), in the presence of sunlight, to form ground level ozone, the key component in what we know as "photochemical smog."

Decades of innovation and experience

To address the global environmental impacts of VOCs, a common by-product of many manufacturing processes, both the EU and the US strictly regulate their emission, requiring that exhaust containing VOCs to be treated before being released into the atmosphere. To help our customers around the world comply with these regulations, Munters introduced our innovative Zeolite rotor concentrator systems (ZEOL) in 1986. There have been countless technological upgrades since then, but the core of the system – the Zeolite concentrator rotor, remains the same.

Cost-effective and energy-efficient

Munters Zeolite systems are known for their reliability, durability and low-maintenance design. They provide extremely cost-effective, energy-efficient removal of organic contaminants from exhaust streams. Our current installed base includes many of the world's most respected companies in the automotive, aerospace, and semiconductor manufacturing industries.



The power of zeolite

What is zeolite?

Zeolite is a naturally occurring crystalline mineral made of hydrous aluminum silicates of sodium, calcium, potassium or barium ions. Natural zeolite is hydrophilic and readily adsorbs and desorbs water. In addition to natural zeolite, more than 70 types of synthetic zeolite have been developed for use in commercial applications.

Hydrophobic zeolite is an inorganic, stable crystal with properties suited to adsorbing VOCs. It is inert and non-chemically reactive, including with strong acids. It is also non-flammable.

Munters Zeol concentrators remove*

- Xylene
- Toluene
- Benzene
- Acetone
- Butanol
- Ethanol
- Ethyl lactate
- Butyl acetate
- Ethyl acetate
- Isopropanol
- Trimethyl benzene
- Trimethyl amine
- Ethanolamine
- Cyclohexanone
- Methyl ethyl ketone
- Methyl amyl ketone
- Methyl isobutyl ketone
- Propylene glycol monomethyl ether (PGME)
- Propylene glycol monomethyl ether acetate (PGMEA)
- N-methylpyrillidone (NMP)
- Dimethyl sulfoxide (DMSO)

* This list is not exclusive – Munters can also address other VOCs.

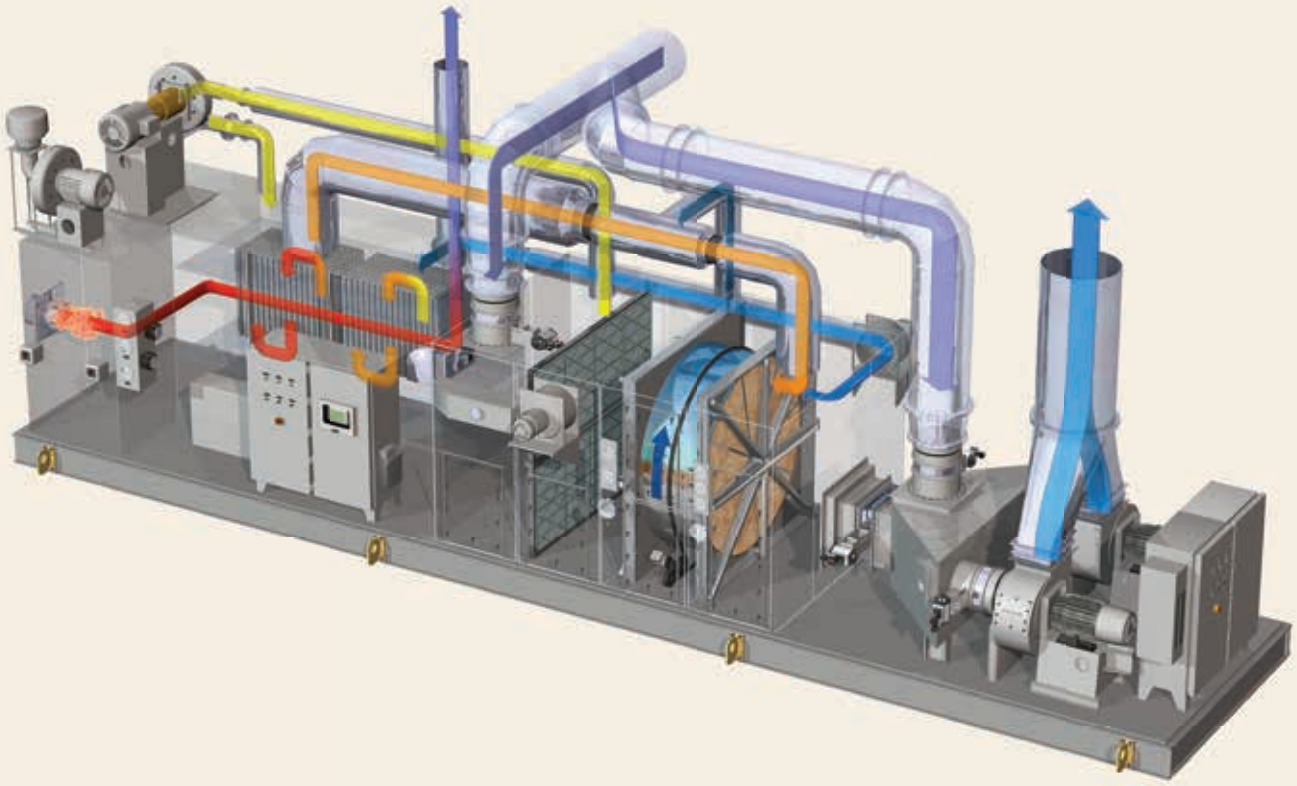
Versatile systems for diverse industries

Munters can design a customized VOC abatement system that addresses the specific needs of your business. We have extensive experience successfully installing Zeolite rotor solutions in a wide range of industrial applications, including:

- Automotive, aerospace, and industrial spray paint finishing
- Coating operations
- Wood finishing
- Paint manufacturing
- Semiconductor manufacturing
- LCD/TFT flat panel display manufacturing
- Printing
- Flexible packaging
- Styrene/composites
- Pharmaceutical manufacturing
- Ground water remediation
- Investment casting

Low total cost of ownership

Compared with regenerative thermal oxidizers (RTOs), recuperative thermal oxidizers, and catalytic oxidizers, Munters Zeolite concentrator systems have a lower total operating cost. They require less natural gas, and the low pressure drop across the system means that they require smaller fans and consume less electricity. Because they are designed for continuous operation and require only a single day per year for maintenance downtime, they maximize production.



The Munters Zeolite system (ZEOL), step-by-step

Solvent-laden air is drawn through the HoneyCombe® rotor, where the hydrophobic zeolite removes VOCs from the airstream through adsorption.

After passing through the rotor, the clean, VOC-free air is discharged into the atmosphere.

The Zeolite rotor turns continuously, 1-6 revolutions per hour, transporting adsorbed VOCs into a regeneration zone, where they are removed by a heated air stream that is 5-10% of the volume of the process air. The regenerated zeolite is then rotated back into the process air stream.

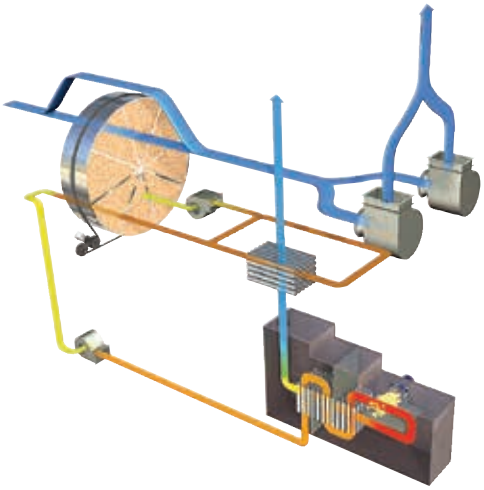
Careful design ensures that the maximum VOC concentration does not exceed safety limits (i.e., 20-25% of LEL). The concentrate is typically sent to a small oxidizer, where the VOCs are converted to water vapor and CO_2.

The energy content of the VOCs contributes to the oxidation process, further reducing the demand for fuel. Multiple heat exchangers recover heat from the oxidizer and desorb the rotor, adding to the fuel efficiency. Munters Zeolite concentrators can achieve destruction and removal (DRE) efficiencies up to 99%.

Common configurations

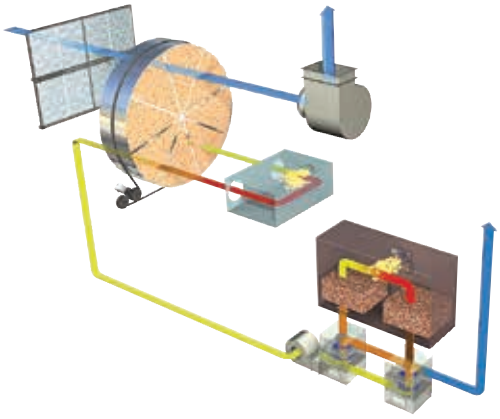
Rotor/thermal oxidizer with redundant process fans/ bypass

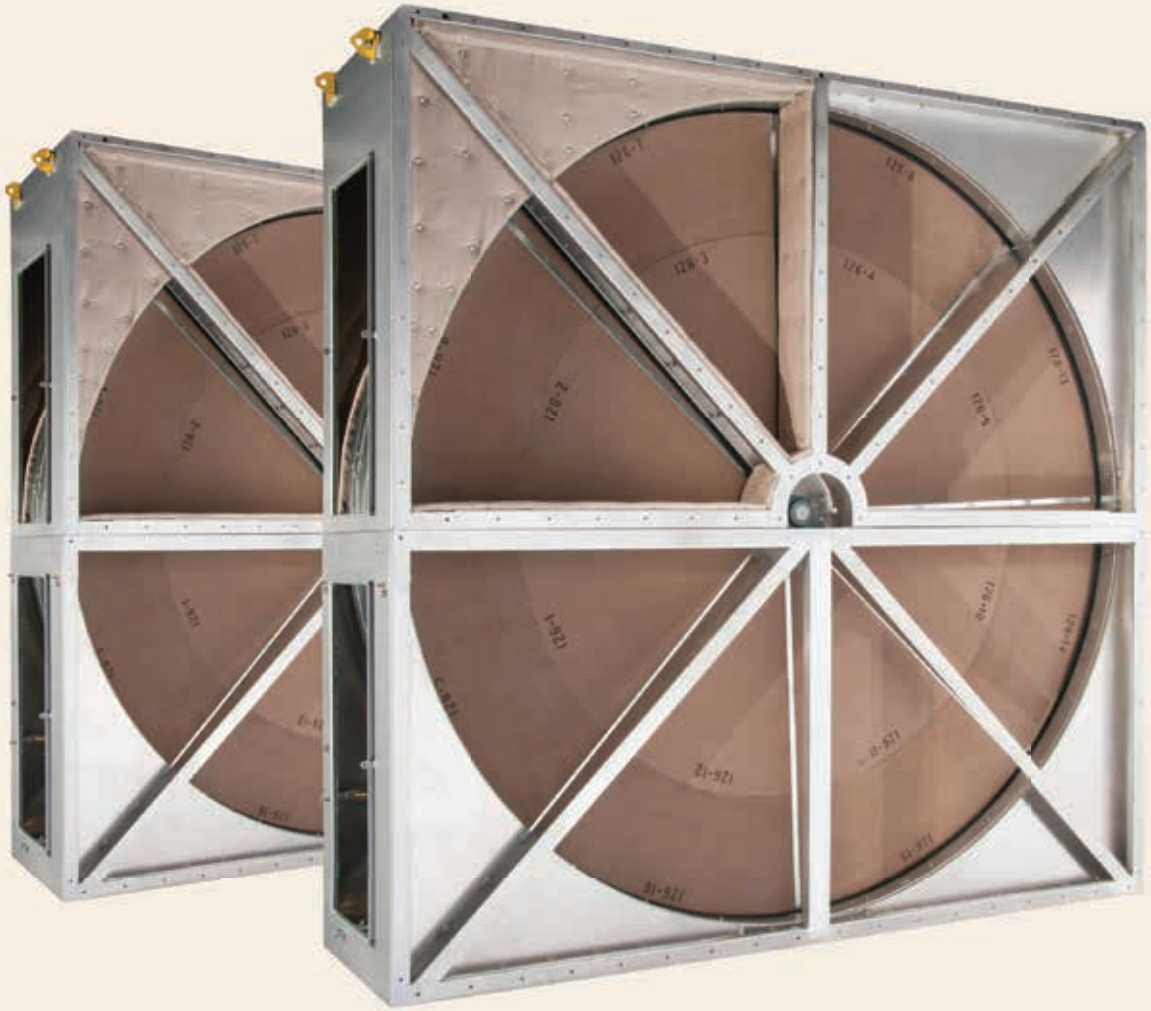
This configuration effectively treats exhaust from semiconductor manufacturing, which requires continuous VOC abatement. Redundant process fans/ VFDs ensure reliability and pressure control. Primary and secondary shell & tube heat exchangers increase fuel efficiency.



Rotor/RTO with desorption heater

This configuration is effective in large-airflow applications such as automotive and aerospace finishing, which can be abated cost-effectively by using concentrator technology and fuel-efficient regenerative thermal oxidation.





Maintenance-free and self-cleaning

Zeolite rotors are manufactured from a corrugated mineral fiber substrate treated with proprietary zeolite and other inorganic materials, which provide physical integrity, rigidity, and enough flexibility to withstand thermal stress. It resists blockage, even from high-boiling-point solvents, particulates, or resinous materials and has a very low pressure drop. The rotor's low-friction contact seals prevent leakage.

Because Munters's proprietary zeolite is hydrophobic, it is not affected by high humidity, instead using all of its pores to attract and hold VOC molecules.

It is an inert, stable inorganic crystal, that eliminates the fire hazards associated with carbon adsorbers.

The rotor's maintenance-free design includes a "self-cleaning" feature that ensures 100% zeolite regeneration and prevents any buildup of VOC on the rotor. High performance efficiency is maintained throughout the life of the rotor, without the need for water washing or high-temperature bake-outs.

Design criteria

The following design guidelines are relevant for common zeolite concentrator applications:

- Process exhaust air temperature less than 48.9°C
- Relative humidity less than 90%
- Solvent concentration of less than 1000 ppm
- Solvents (VOCs) with boiling points greater than 37.8°C

Integrated Zeolite systems (IZS)

Rotor model	Rotor diameter (mm)	Flow capacity (NCMH)	Footprint* LxWxH (cm)	Weight (kg)
IZS-1500-TH	1,500	4,815 – 16,050	1,219 x 244 x 366	9,072
IZS-2190-TH	2,190	7,704 – 27,285	1,341 x 274 x 366	12,701
IZS-2446-TH	2,446	15,248 – 40,125	15,248 – 40,125	13,608
IZS-2946-TH	2,946	23,273 – 56,175	1,585 x 285 x 419	20,865
IZS-3546-TH	3,546	38,520 – 80,250	1,669 x 386 x 472	21,772
IZS-4200-RTO	4,200	64,200 – 112,350	1,707 x 439 x 671	24,948
IZS-4800-RTO	4,800	80,250 – 144,450	1,768 x 518 x 732	27,216

Rotor systems (RS)

Rotor model	Rotor diameter (mm)	Flow capacity (NCMH)	Footprint* LxWxH (cm)	Weight (kg)
RS-1500	1,500	4,815 – 16,050	335 x 213 x 203	1,043
RS-2190	2,190	7,704 – 27,285	396 x 244 x 249	1,687
RS-2446	2,446	15,248 – 40,125	396 x 279 x 269	2,517
RS-2946	2,946	23,273 – 56,175	396 x 323 x 315	3,266
RS-3546	3,546	38,520 – 80,250	457 x 381 x 371	4,082
RS-4200	4,200	64,200 – 112,350	549 x 439 x 447	5,126
RS-4800	4,800	80,250 – 144,450	549 x 518 x 533	6,577

Basic units (BU)

Rotor model	Rotor diameter (mm)	Flow capacity (NCMH)	Footprint* LxWxH (cm)	Weight (kg)
BU-1500	1,500	4,815 – 16,050	61 x 198 x 203	272
BU-2190	2,190	7,704 – 27,285	91 x 244 x 249	1,089
BU-2446	2,446	15,248 – 40,125	91 x 279 x 264	1,361
BU-2946	2,946	23,273 – 56,175	91 x 323 x 315	1,633
BU-3546	3,546	38,520 – 80,250	91 x 381 x 371	2,722
BU-4200	4,200	64,200 – 112,350	91 x 447 x 437	2,903
BU-4800	4,800	80,250 – 144,450	122 x 490 x 488	4,218

* Includes process fans and bypass. Munters can provide alternate arrangements to reduce length. 91–122 cm maintenance access space required around perimeter.

Custom design options

Munters is the industry leader in zeolite rotor concentrator solutions, with hundreds of systems installed worldwide. We custom design each system according to local permit requirements, necessary destruction efficiency, and our customer's specifications.

Options include:

- Modular design with flexible configurations
- Automatic system bypass
- Exhaust during equipment shutdowns
- Redundant fans/VFDs for 100% up-time exhaust reliability
- Variable flow rates to reduce energy use
- Particulate pre-filters
- Heat exchangers for maximum fuel efficiency
- Pre-conditioning process air (i.e., temperature, humidity)
- Pressure control
- Flexible control packages with pre-programmed flatscreen interface (UL/CSA/CE)
- Remote monitoring
- Seismic restraints
- Vibration isolation
- Emission testing
- Exhaust stacks
- Carbon adsorption bypass
- Thermal Recuperative or Regenerative oxidizers (RTOs)
- RTO hot gas bypass for high LELs, to further reduce energy consumption
- Acid gas scrubber for halogenated VOCs
- Commissioning, training, project management, turnkey installation

Climate solutions for the future

And for your mission-critical processes

Founded in Sweden in 1955, Munters today has 20 manufacturing facilities across the globe and sales offices in more than 30 countries. With approximately 4,000 employees worldwide, we have net sales approaching €1 billion EUR.

Munters is a global leader in climate solutions for mission-critical processes. We offer innovative, efficient, sustainable solutions for controlling humidity and temperature, recovering energy, treating emissions, and using evaporative cooling for comfort, manufacturing, and environmental protection.

Sustainability is an important aspect of our business strategy and value creation. Our solutions help customers use resources efficiently, reducing their climate and environmental impact, ultimately contributing to a better climate and reduced carbon emissions.

Munters Service portfolio

At Munters, we are committed to offering a complete portfolio of service offerings to support you throughout the entire lifecycle of your Munters equipment.

Commissioning support

Our trained service technicians make sure your equipment is operating as designed so your investment gets the best possible start. We offer everything from basic unit start-up to extensive turnkey installations.

Maintenance

Keep your equipment running like new with on-site visits by factory-trained technicians and regular rotor performance checks.

Retrofit and upgrade

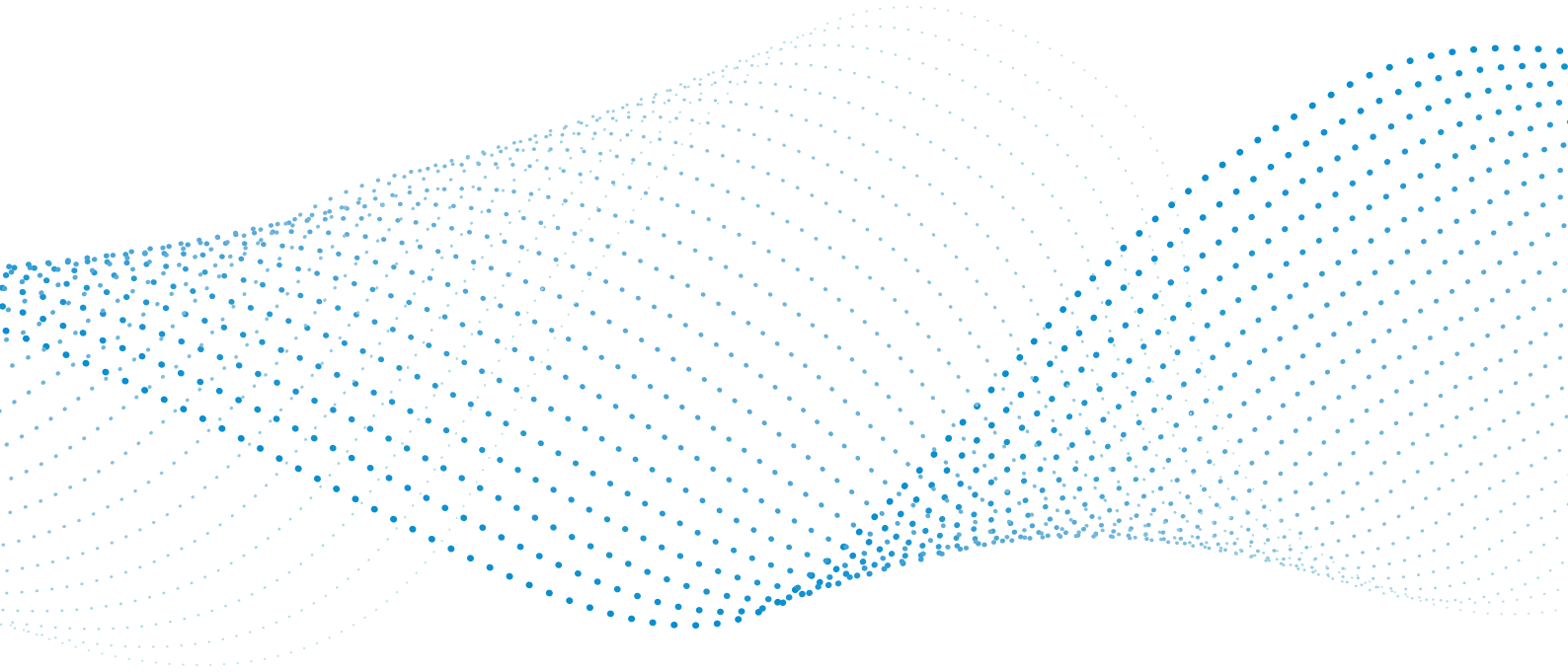
Boost energy efficiency and capacity with our retrofit solutions for equipment already in operation. Upgrade controls, replace your rotor or upgrade your fan to maximize performance, save money and energy. Munters also custom fabricates zeolite blocks for replacement of all zeolite and carbon rotor systems.

Munters Service Agreements

Ensure that your Munters equipment always performs according to specifications. Munters Service Agreements, tailored to your needs, offer industry-leading lifecycle care for your equipment – and peace of mind for yourself.

Munters Genuine Parts

We use only Munters Genuine Parts, which are designed, tested, and verified to ensure that each part meets or exceeds specifications. Convenient service kits are made to make maintenance simple.



Munters is a global leader in energy-efficient air treatment and climate solutions. Using innovative technologies, Munters creates the perfect climate for customers in a wide range of industries.

Munters has been defining the future of air treatment since 1955. Today, around 4,000 employees carry out manufacturing and sales in more than 30 countries.

For more information, please visit www.munters.com

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