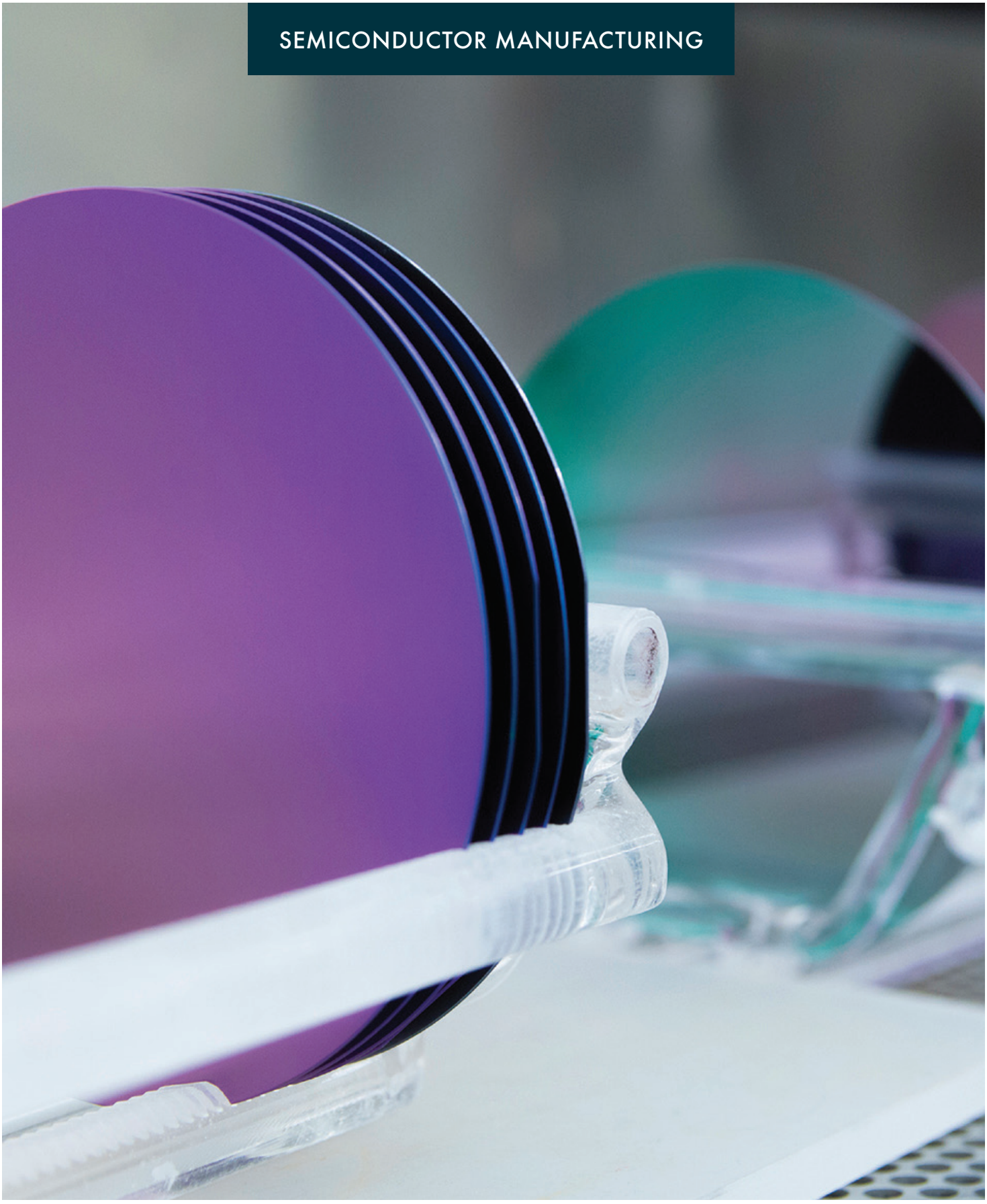
SEMICONDUCTOR MANUFACTURING



Complete Climate Control

Control humidity and solvent emissions

Munters

Your Perfect Climate

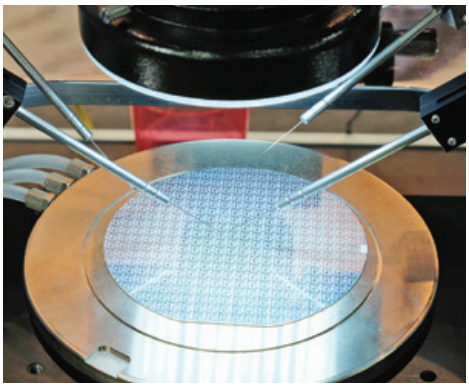
Many semiconductor and electronics manufacturing processes and operations require closely controlled dry conditions.

Dehumidification

A Munters dehumidification system provides a simple, cost effective way to insure a stable humidity control level in all seasons. It supplements rather than replaces standard clean room air handling systems, which preserves your investment and increases the reliability of your process.

THE CHALLENGE

When the humidity level fluctuates in a wafer fabrication area, a host of problems can occur. Resist characteristics change, bake-out times increase, and generally the entire process becomes more random and less predictable.



Assembly Area

The ultrafine geometry of today's photomasks makes them very vulnerable to corrosion when the humidity exceeds 35% RH (Relative Humidity). Munters insures that your control level can eliminate humidity-related photomask corrosion and reduce circuit corrosion following plasma etch.

Wafer Fabrication Area

As spinners spray developer onto the wafer surface, the solvents evaporate rapidly, cooling the wafer low enough to condense moisture from the air. This extra water on the resists can change the developer characteristics and be absorbed into the resist itself, causing the polymer to swell. The 35% control level largely eliminates these problems because the solvent evaporation cannot cool the surface temperature below the air dew point.

Photolithography Room

At high moisture levels, the silicon will behave as a desiccant, attracting moisture to its surface, which interferes with photoresist adhesion. The 35% RH control level reduces this problem significantly.

Vacuum Chamber

Water vapor is the largest load on cryopumps and other vacuum equipment. Controlling at 35% RH, rather than 45%, removes over 25% of the total moisture load from pumps. This means faster pumpdown and improved batch processing speed.

Chilled surfaces in epitaxial equipment can condense moisture from the air, leading to corrosion and slowing batch processing time. Controlling at 35% RH eliminates the condensation.

Conventional Systems

Conventional air treatment systems for clean rooms closely control particulate and temperature levels.

To remove particles, the system circulates a great deal of air, creating laminar flow and sweeps the particles into filters.

These systems control temperature by operating with a very small difference between the temperature of the air entering and leaving the room. In addition, they process large air volumes, giving them the ability to provide a very even thermal condition across the room. While this is the ideal system for temperature and particulate control, it is not effective in controlling moisture. It does not remove moisture because the temperature differences are so small that no condensation takes place on the cooling coils.

Often a separate system can cool the air deeply, condensing its moisture and reheating the air back to the room condition. In real world operations, however, these cooling-based systems seldom achieve stable humidity control.

Cooling systems are limited in their capacity to dehumidify. They can only cool the air to 40°F before part of the cold surface will be below 32°F and the coil will freeze. When weather conditions are muggy and rainy, these systems struggle to keep up with the increasing moisture load. Then the coil freezes as it tries to cool below its natural capacity. The frequent, large swings in the room humidity level are a direct result of this capacity problem.

Straining to keep up with moisture loads also puts a great deal of wear and tear on such cooling-based systems. This leads to high maintenance costs and unscheduled maintenance.

Benefits of Dehumidification

- Photomask protection
- Reduced resist swelling
- Improved resist adhesion
- Faster vacuum pumpdown
- Protects EPI equipment

THE SOLUTION

Munters dehumidification system is designed to deal with the moisture problem at its source: the outside air brought into the system to provide ventilation and pressurization.

The moisture in the outside air is 85% of the total moisture load in the space, so the Munters system goes to the heart of the problem by removing this water vapor before it gets into the room.

In the first part of a two-stage process, conventional cooling coils condense much of the moisture out of the air. In the second stage, the desiccant dehumidifier pulls the balance of the moisture out of the air, delivering it in a very dry condition to the clean room. The dehumidifier has made the ventilation air far drier than it could ever be with cooling coils. It now acts as a "sponge," absorbing the excess moisture generated in the space and allowing steady control at 35% RH.

The system responds to changes in room humidity by varying the amount of air passed through the dehumidifier. When the room condition goes above 35% RH, more air passes through the dehumidifier. If the moisture level drops below the control point, moist air passes around the dehumidifier into the room, raising the moisture level back to 35% RH. Filters are included in the system and remove particles in the outside air before they can become a load on the HEPA filters of the room ceiling.

Since the system mounts on the outside, existing facilities can be retrofitted without disturbing mechanical systems already in place. The system comes complete with pre-cooling and controls, and is designed to take advantage of existing utilities.

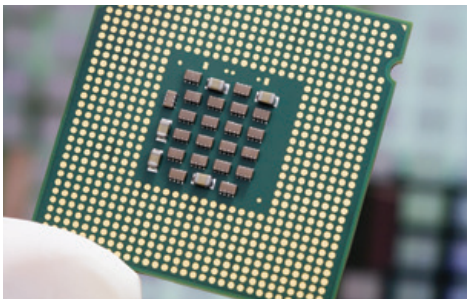
The key to a stable control level is a system designed for dehumidification rather than just cooling. Munters delivers a stable 35% RH control level in all seasons, even during muggy, rainy summer weather that causes air conditioning systems to fail.

VOC (Volatile Organic Compound) Abatement

In addition to creating optimal air conditions, Munters offers a range of Zeol VOC abatement products to clean exhaust air laden with VOCs produced by the semiconductor manufacturing process.

THE CHALLENGE

VOCs are harmful to human health and the environment. Most semiconductor fabrication plants exhaust large volumes of air containing low concentrations of these harmful compounds. Global environmental laws are imposed to require treatment of VOCs and odors before they can be released to the atmosphere, which can be a costly expense.



Personal Health and Environment

Personal Health: The VOCs used in the fabrication of chips and other electronics can be harmful for human inhalation, causing respiratory issues and other health concerns. Therefore, the fab plant's air must be constantly evacuated to ensure human safety.

Environment: If VOCs are left untreated once they are exhausted from the fab plant, they can contribute to environmental concerns, including the creation of smog.

Tooling is Sensitive to Pressure Fluctuations

The tools within the fab for chip manufacturing are very sensitive to pressure fluctuations. Such occurrences can result in loss of product and thus are costly.

Minimal Downtime

Semiconductor fabs manufacturing electronics and chips require extreme uptime, very often only allowing for 24 hours per year for scheduled maintenance. The equipment must be reliable.

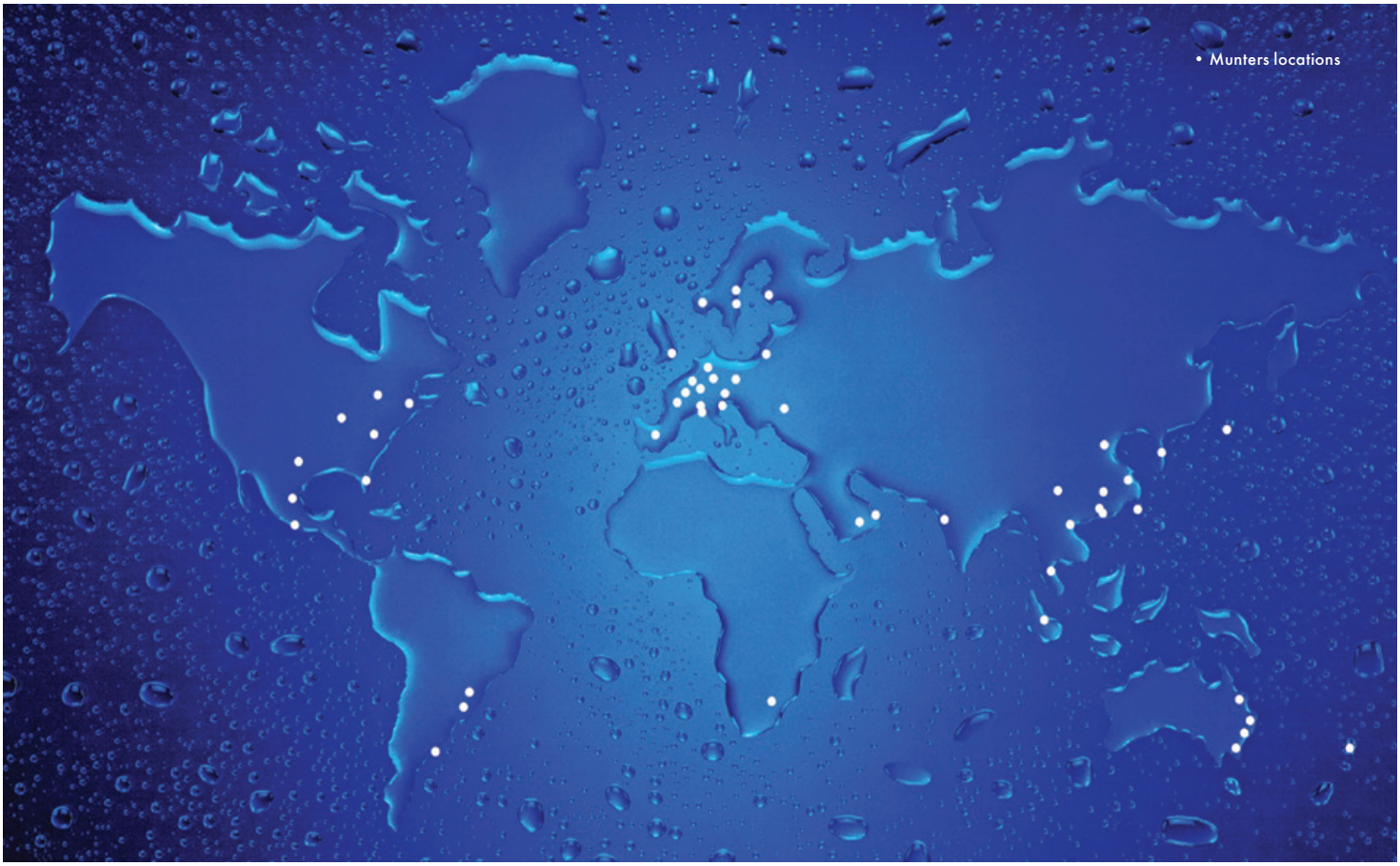
THE SOLUTION

Munters Zeolite Rotor Concentrator Systems are the leading technology for VOC abatement. Zeol systems concentrate large exhaust volumes containing low concentrations of VOCs into a small concentrated stream that can be efficiently and cost-effectively destroyed in an oxidizer. Removal and Destruction Efficiencies (DRE) of up to 99% are possible to meet local environmental regulations.

For the semiconductor industry, with 24/7 manufacturing schedules, Munters VOC abatement technology delivers superior reliability, steady flow exhaust with minimal pressure fluctuations and considerable savings on operating costs.

Benefits of VOC Abatement

- High removal and destruction efficiencies
- No pressure fluctuations
- Reliable 24/7 uptime
- Small footprint with easy installation
- Low operational costs



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, the largest being food, pharmaceutical and data center sectors. Munters has been defining the future of air treatment since 1955. Today, around 3,500 employees carry out manufacturing and sales in more than 30 countries. Munters reports annual net sales in the region of SEK 6 billion and is listed on Nasdaq Stockholm.

For more information, please visit www.munters.com.

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