



**eBook**

# **Introduction To Plant-Based Odor Control Solutions**

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How plant oils are used to  
neutralize industrial odors





eBook

# Introduction To Plant-Based Odor Control Solutions

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## INTRODUCTION

Odors are a by-product of many industrial processes. In fact, some numbers estimate more than 1 million industrial sites in the U.S. generate odors as part of their operations. Because odor control is usually a non-essential expense, it is often the last problem addressed by an odor-producing operation and often only after pressure is brought by the public or government agencies.

Some of the strongest odors come from facilities that were once remote but have seen residential and commercial development close in on its buffer space. Odors that were once negligible are gaining more attention — bringing complaints, regulations, fines, and even lawsuits. These facilities and industries include (but are not limited to):

- Asphalt production
- Breweries
- Energy companies
- Fertilizer manufacturers
- Fluid handling
- Cannabis growers
- Chemical & pharmaceutical plants
- Composting stations
- Food processing
- Landfills
- Liquid waste
- Metalcasting
- Mining
- Petroleum refineries
- Printing
- Pulp & paper processing
- Rubber & plastic production
- Tanneries
- Textile mills & plants
- Urban drilling
- Wastewater treatment plants
- Woodworking & material production

To combat these nuisance odors, facilities have historically relied on complex air scrubbing systems, masking agents, or other complicated solutions — many of which are either **expensive to implement and maintain** or **not effective** at removing odors completely or permanently. To make it worse, many odor control methods use **harmful chemicals, toxic ingredients, or leave behind noxious residuals** that can cause danger to workers, neighboring residents, and the environment.

Enter plant-based odor removers, a natural, safe alternative to more costly, complicated solutions. Plant-based odor removers use plant oils to find and neutralize odor molecules. And since they only use ingredients you'd find in nature, they are safe to use around people and leave behind no harmful pollutants.

Many industries are turning to plant-based odor solutions to remove the toughest odors, while **lowering maintenance costs** and **boosting effectiveness** — especially as they look to engage more eco-friendly practices. The result is less odor complaints, better company reputation, happier employees, and fewer legal issues.

## WHAT IS ODOR?

### The Science of Odor

The chemical and physical structure and characteristics of molecules in most odorous substances produce the stimuli to the olfactory sensory cells that are responsible for smell. The sensation of odors differs among people. Many are incapable of detecting some odors, but are very sensitive to others.

Some odor-bearing substances in weak concentrations cause more intense olfactory response than when in strong concentrations. For instance, hydrogen sulfide ( $H_2S$ ) in low concentrations is easily detectable; but in concentrations greater than 100-150 ppm,  $H_2S$  overcomes the olfactory senses and becomes odorless to humans (as well as toxic).

These and many more varying characteristics of odor production — and the randomness to which people are affected by smells — have made **odor control a very difficult problem for engineers** at odor-causing industrial facilities.

### Odor Facts

- Individual substances cause different and unique odors.
- Some substances have several possible odors, although this normally depends on concentration.
- Two or more odors can cancel out each other. Both mixed together can be scentless.
- Nearly all odors can be lessened, made worse, or neutralized.
- Odors can only be detected for a limited amount of time before the sensory nerves are saturated.





## WHAT IS ODOR?







### Odor Effects on People

People can distinguish more than 5,000 odors. Odors can alter or create moods. People can remember, recall, and make connections between odors and experiences or places. Good or **bad odors can become a signature scent** of a facility or business, even overriding positive characteristics.

It has been proven that odors can cause increased heart rates, respiration, blood pressure, and even pain. Continued exposure to an odor can eventually **cause loss of the ability to smell**. People associate some odors with human excrement, spoiled food, disease, or other unpleasantness. When such odors are present, people often become uncomfortable, unhappy, or fearful and can associate these emotions with their source.

The increasing population and density in urban areas and development into rural areas has made odor more of an issue. Odor-causing industries are removed from their neighbors as they were even a few decades ago, when population was more spread out.

### Common Odor Sources

| Chemical Group  | Compound         | Smells                          | Industries/Sources  |
|---|------------------|---------------------------------|---|
|  Sulfides              | Hydrogen Sulfide | Rotten egg                      | Asphalt, Brewing, Composting, Food Processing, Pulp & Paper, Wastewater |
|  Mercaptans            | Methyl Mercaptan | Rotten vegetables               | Landfills, Oil & Petroleum, Plastics, Pulp & Paper, Wastewater          |
|  Amines                | Ethylamine       | Urine, rotten fish, rotten meat | Composting, Metalcasting, Tank Cleaning, Wastewater                     |
|  Fatty acids with odor | Butyric Acid     | Rancid butter                   | Composting, Food Processing   |
|  Aldehydes             | Formaldehyde     | Pungent, bitter                 | Adhesives, Manufacturing, Plastics, Tank Cleaning                       |
|  Ketones               | Acetone          | Acrid                           | Chemicals & Pharmaceuticals, Solvents, Synthetic Fibers                 |

## WHAT ARE PLANT-BASED ODOR CONTROL SOLUTIONS?

### Plant Oils as Odor Control

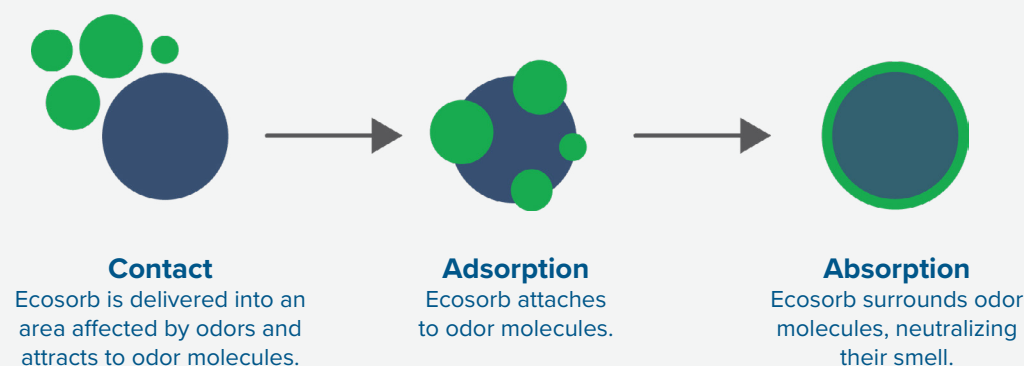
Plant oils can be extracted from various plant parts, such as leaves, fruit, bark, root, grass, wood, heartwood, gum, balsam, berries, seed, flowers, twigs, and buds. Science once believed plant oils were only good as odor masking agents and had no potential to actually neutralize smells. However, **testing shows that certain plant oils have the ability to neutralize odors.**

### Simple Science

With the use of bio-based surfactants, plant oils can form an emulsion with water. This mixture can be sprayed into the air to combat odorous compounds. The atomized droplets form a weak interaction with odorous compounds in the air.

The first mechanism in plant-based odor control is solubility. Industrial malodor gasses vary in terms of solubility in water. This variation ranges from “insoluble” such as styrene to “very soluble” such as ammonia. When in an emulsion with water, plant-based odor removers increase the solubility of most malodor gasses and make them more able to be controlled.

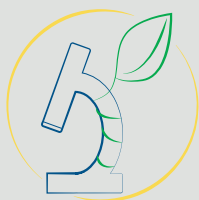
Once the gas is dissolved (absorbed) into the atomized droplets, the second mechanism of neutralization comes into play. Plant oils and some odorous gasses react through acid/base reactions resulting in neutralization of the odorous gas.



## WHAT ARE PLANT-BASED ODOR CONTROL SOLUTIONS?

### Benefits of Plant-Based Odor Removers

When examined against other common odor solution techniques, the comparisons are stark. Most solutions require complex systems which are costly to build, use, and fix, and demand expertise to maintain. Many solutions depend on hazardous materials that can produce harmful compounds, exhaust, or even residual odors.



#### Effective

Uses the natural power of plant oils to remove odors, without complicated systems or synthetic materials.



#### Natural

No harsh, toxic chemicals mean products are not dangerous for people or the planet.



#### Safe

Independent research and testing prove they work to neutralize even the toughest odors.



## OTHER COMMON ODOR CONTROL METHODS

How they compare to plant-based solutions.



### MASKING AGENTS

How it Works:

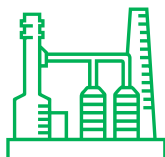
Chemicals are sprayed into the air, using synthetic fragrances to “hide” odors.

#### PROS

- Masking agents can come in many scents and cover a broad range of odors.
- They can be used outside facilities so they do not impact finished goods and can come in non-hazardous formulas.

#### CONS

- Give an immediate cover to odors, but the odor eventually returns as the fragrance and odor molecules separate.
- Many use hazardous chemicals and are delivered by harmful aerosols.



### CHEMICAL SCRUBBERS

How it Works:

Odors are added to highly reactive chemicals — acids, caustics, oxidizers, and surfactants. The odorous compounds chemically react with the solution, removing odors.

#### PROS

- Mechanics can be monitored and carefully controlled.
- Systems are popular: known technology with standard, “textbook” designs.

#### CONS

- Expensive to build; must be operated by trained personnel and serviced in protective gear.
- Must be designed for a specific application, with careful considerations for dangerous exhaust gas.
- Chemicals used are considered reactive, hazardous, and must be neutralized before disposal.



### ADSORPTION (CARBON FILTERS)

How it Works:

Gas particles from the air penetrate the pores of an adsorbent material — activated carbon, zeolite, or silica gel — and removes odors from the air as it passes through.

#### PROS

- Carbon is porous and has a large surface area, which allows it to absorb odors in the air.
- Activated Carbon is a common adsorbent for organic odor removal.
- Activated Carbon is used to remove sulfur bearing compounds, aldehydes, and ketones.

#### CONS

- Reversible in nature, which allows odors to return if heated.
- Spent media disposal can be messy and expensive, especially when it contains hazardous compounds.
- Adsorbents are consumable and must be re-activated or replaced.



### OZONE

How it Works:

Generators create ozone molecules, which are highly reactive to organic material.

#### PROS

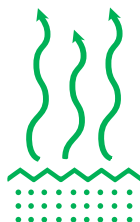
- Ozone is a powerful oxidant and anti-microbial.

#### CONS

- Can cause side effects if used around people; treated areas must be evacuated while in use and hours afterward.
- Extremely caustic and could damage items or react to other chemicals in treatment areas.
- Not effective on inorganic odors.



## OTHER COMMON ODOR CONTROL METHODS



### BIOLOGICAL FILTERS (BIO-FILTERS)

#### How it Works:

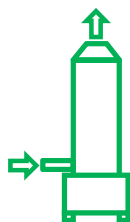
Contaminated air passes through soil, compost, wood chips, or other organic material. As the odorous air flows through the material, pollutants (including odor molecules) transfer into a thin biofilm on its surface. Microorganisms in the biofilm eliminate odors.

#### PROS

- Bacteria used are naturally occurring and can metabolize many organic odor-causing compounds.
- Works on odors that are biodegradable and water-soluble.
- Effective at reducing sulfur containing volatile organic compounds.

#### CONS

- Large units with massive footprints are needed to treat airflow.
- Microbes must interact with the odorous compounds over long periods.
- Material must be replaced, causing odors to go untreated during downtime.



### BIOLOGICAL OXIDATION (SCRUBBER)

#### How it Works:

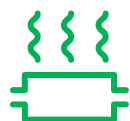
Air is forced upward through an adsorption column filled with synthetic material. Water containing microorganisms circulates through the system, feeding off odor-causing compounds and releasing clean air.

#### PROS

- These units work well to reduce odors caused by ketones, alcohols, and ethers.

#### CONS

- Equipment needed to recirculate water in bioscrubbers makes for expensive up-front and operating costs.
- \* Requires selection of lab-developed bacterial strain.



### THERMAL & CATALYTIC CONVERTERS

#### How it Works:

The system burns odorous gases, supposedly destroying process odors. The gas is passed over (or through) catalytic materials, converting residual gases into compounds like carbon dioxide, nitrogen, and water.

#### PROS

- There has been widespread development for different catalytic mediums, mainly for “reduction” and “oxidation” catalysts.

#### CONS

- Can introduce a host of toxins and noxious substances into the air.
- Even for well-designed and operated systems, there is a need for catalyst saturation and sterilization.



### INCINERATION

#### How it Works:

Odor-causing waste and gas are burned at high temperatures.

#### PROS

- The incineration process is effective against organic odors.

#### CONS

- Dangerously high temperatures — usually around 1472°F (800°C)— are needed to destroy gas.
- Expensive, not always effective, and generally introduces toxins and additional odors into the atmosphere.
- Additional air is sometimes required and can cause volatile gases to be released from the waste gas.

## OTHER COMMON ODOR CONTROL METHODS

### Odor Solution Method Comparisons

|                                 | Plant-Based Odor Removers | Masking Agents | Adsorption (Carbon Filters) | Ozone | Bio-Filtration |
|---------------------------------|---------------------------|----------------|-----------------------------|-------|----------------|
| Uses Natural Ingredients        | ●                         |                | ●                           |       | ●              |
| Non-Hazardous                   | ●                         |                | ●                           |       | ●              |
| Safe for the Environment        | ●                         | ??             | ●                           |       | ●              |
| Simple Setup and Use            | ●                         | ●              |                             |       |                |
| Removes Odors Completely        | ●                         |                |                             | ●     |                |
| Effective on Organic Odors      | ●                         |                | ●                           | ●     | ●              |
| Effective on Inorganic Odors    | ●                         |                | ●                           |       | ●              |
| Cost-Effective (Implementation) | ●                         | ●              |                             |       |                |
| Cost-Effective (Maintenance)    | ●                         | ●              |                             |       |                |

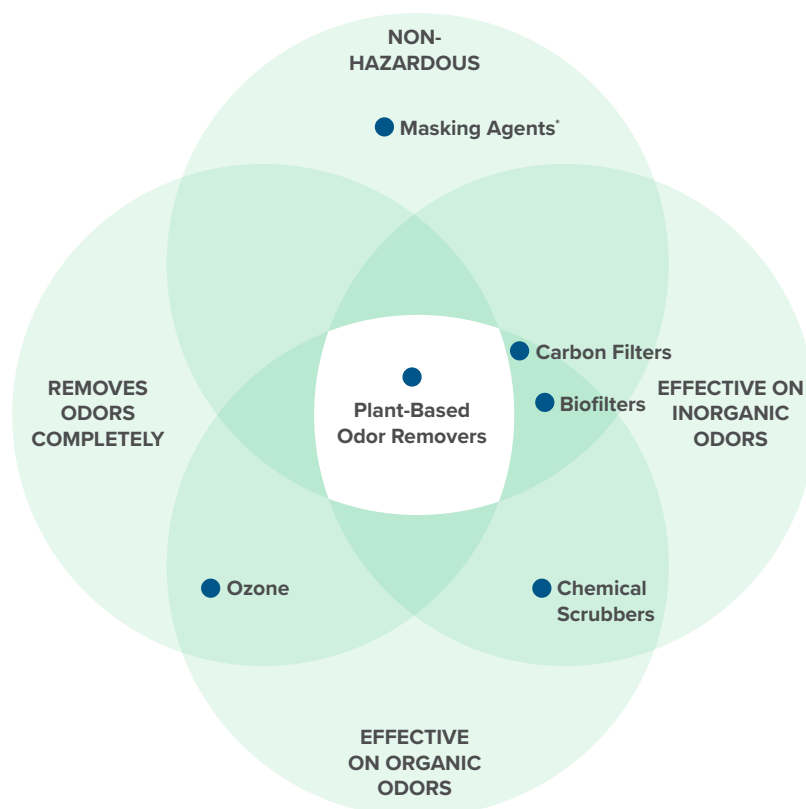
|                                 | Biological Oxidation | Thermal & Catalytic Converters | Incineration |
|---------------------------------|----------------------|--------------------------------|--------------|
| Uses Natural Ingredients        | ●                    |                                |              |
| Non-Hazardous                   | ●                    |                                |              |
| Safe for the Environment        | ●                    |                                |              |
| Simple Setup and Use            |                      |                                |              |
| Removes Odors Completely        |                      |                                |              |
| Effective on Organic Odors      | ●                    | ●                              | ●            |
| Effective on Inorganic Odors    | ●                    |                                |              |
| Cost-Effective (Implementation) |                      |                                |              |
| Cost-Effective (Maintenance)    |                      |                                |              |

\*Masking agents that use fragrances have been proven to include harmful ingredients. In University of Washington research of common air fresheners, they found on average 17 chemicals in each product — nearly a quarter which would be classified as toxic or harmful. [Source](#)

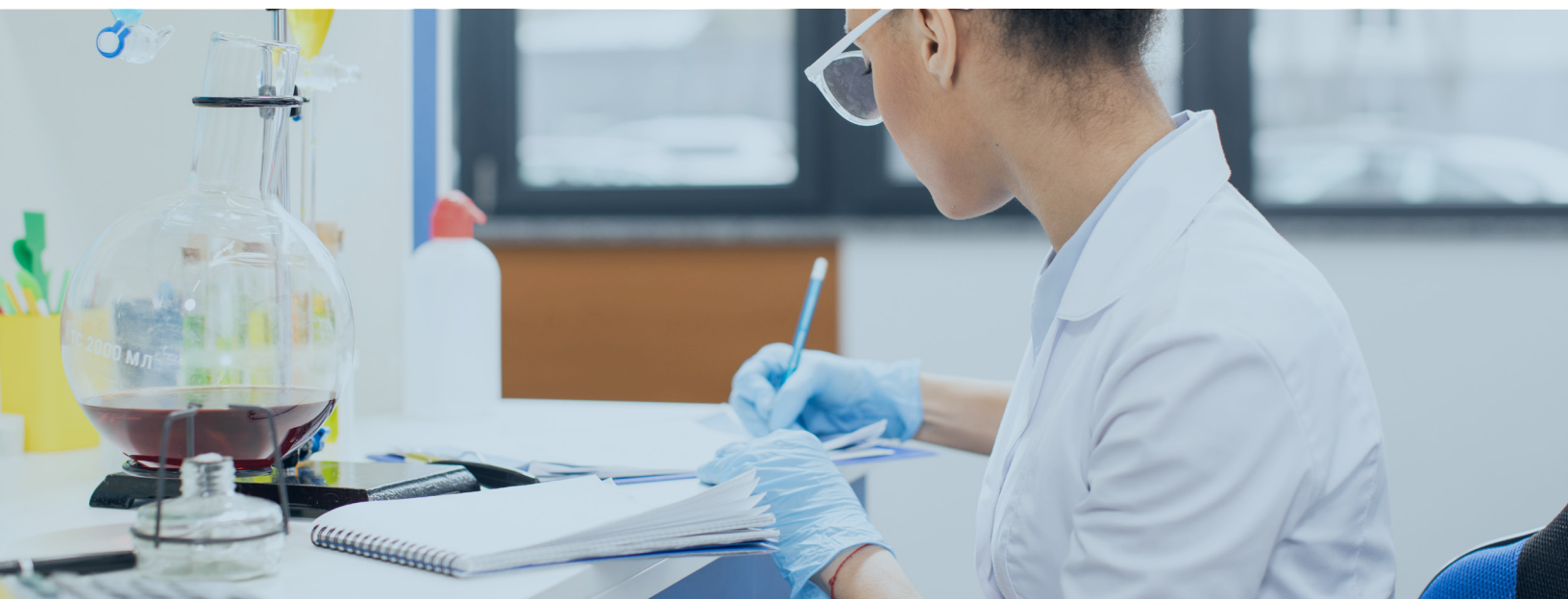


## OTHER COMMON ODOR CONTROL METHODS

### Odor Solution Method Comparisons



\*Masking agents that use synthetic fragrances have been known to use harmful ingredients



## USING PLANT-BASED ODOR REMOVERS

### Get Rid of Odors. For Good. Trust Ecosorb by OMI Industries.

Ecosorb® by OMI Industries is the leader for **natural, safe, effective, and complete** plant-based odor solutions for any industry. They don't mask smells, they get rid of them for good by breaking down and neutralizing odor molecules. Each product includes plant-based ingredients that are safe for the public — neighbors, employees, communities — animals, and the planet.

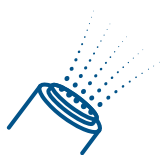
For almost 30 years, Ecosorb® has used simple science to harness the power of plants as natural odor removers. Our proprietary blend of plant oils tackle the toughest smells **without dangerous side effects**. Ecosorb is strong enough to battle the worst odors — from landfills to refineries to wastewater treatment facilities — yet **safe for people and the environment**.

### Application Options



#### Additives

Infused directly into product with no effect on quality.  
*Asphalt binders, petroleum oils, synthetic oils, rubber, plastics*



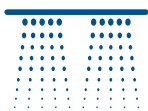
#### Atomization

Mixed with water and sprayed by nozzles or fans.  
*Airborne odor treatment at landfills, water treatment plants or manufacturing facilities*



#### Maintenance Hole Gel Insert

Placed inside manholes to “scrub” escaping air of odors.  
*Odorous gas escaping from underground*



#### Spray Gel

Applied to top of open solutions to keep odors from escaping.  
*Waste trucks, landfills, food processing trucks*



#### Vapor Phase (Vaporization)

Dry mist distributed without added water.  
*Airborne odor treatment in small or large spaces*



## USING PLANT-BASED ODOR REMOVERS

### Our Process

Implementing an Ecosorb solution is **less complicated than other common odor control methods**. Our experienced team partners with each customer to create a complete control plan based on specific odor issues.



#### *Design*

Using our years of expertise in odor control, we match your odor problem to an existing Ecosorb blend. In some cases, a custom formula is needed to battle unique odor combinations, like those found in cannabis grows of different strains. Chemists at OMI Industries can determine the best mix of ingredients for each odor issue.



#### *Build*

We manufacture, engineer and customize equipment to deliver Ecosorb, based on each application and its environment — weather, delivery method, output volume, and more.



#### *Outfit*

Ecosorb delivery systems fully integrate with your existing equipment and processes. Our engineers work with your team to install and maintain a complete odor solution.

### Get Started

To learn more about Ecosorb solutions and equipment, visit [EcosorbIndustrial.com](https://www.EcosorbIndustrial.com) or contact us at 800-662-6367.

