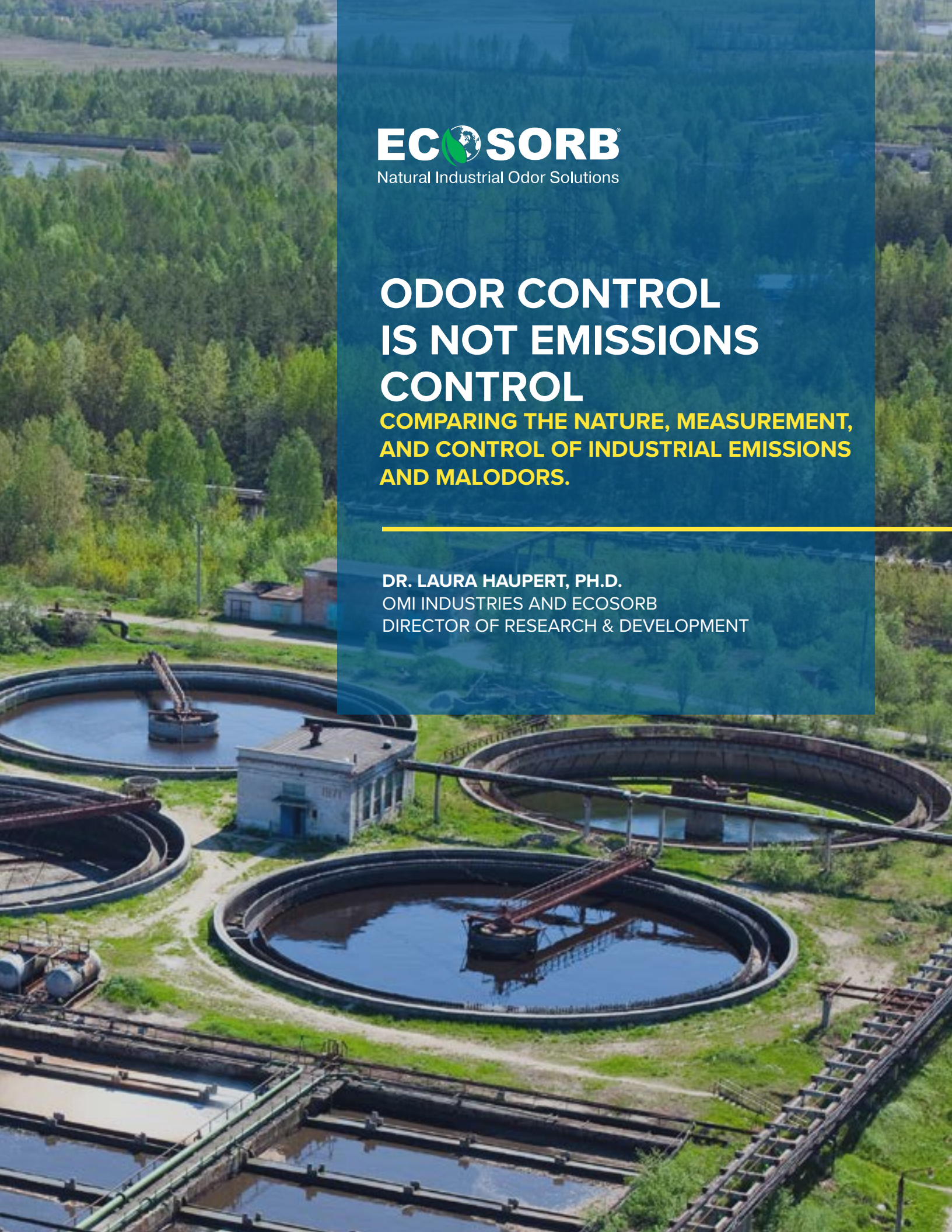

ECOSORB®
Natural Industrial Odor Solutions

ODOR CONTROL IS NOT EMISSIONS CONTROL

COMPARING THE NATURE, MEASUREMENT, AND CONTROL OF INDUSTRIAL EMISSIONS AND MALODORS.

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INTRODUCTION

HOW EMISSION CONTROL DIFFERS FROM ODOR CONTROL

Industries across markets consider emission control and odor control important processes to improve safety and protect their reputations. Many believe the two to be interchangeable. However, there are stark differences between the nature of emissions and odor and the technologies used to control them.

Emission control usually involves **capturing or destroying chemical emissions** before they are emitted into the atmosphere. In odor control methods, **odorous gasses do not necessarily need to be removed** from the process air; it only needs to be undetectable by olfactory senses. Therefore, more costly emission add-on controls do not be used if operators can effectively remove odors.

Frequently, emission controls also result in odor control. If compounds do not enter the atmosphere our olfactory senses will not detect them. However, **some techniques used to capture emissions can emit odors** as a byproduct of the process.

Manufacturing sites can emit odorous compounds into the air up to a certain level per year. But regulations often disallow the site from emitting nuisance odors that disturb neighboring businesses or residents. Out of precaution, some manufacturers will turn to emission control when simple odor control would do the job.

Over more than 30 years of industrial odor control applications, Ecosorb® chemists and engineers have become experts in both emissions and malodors. Including the best methods and technologies for limiting their negative impact.

EMISSION CONTROL OVERVIEW

Among the popular emission control technologies, each has its benefits and shortcomings. They all effectively treat the specific hazardous gases for which they are designed; however, they cannot control a broad spectrum of odors.

Popular Emission Control Methods

- Chemical Scrubbers
- Activated Carbon Adsorption
- Biological Filters
- Thermal & Catalytic Converters
- Incinerators

Many emission control devices **produce an odorous off-gas.** Scrubbers often require handling of acids or caustics. All emission control devices are considered costly capital investments with most having high recurring costs.

The efficiency of all emission control devices is measured by the ability to remove a specific gas (or gases) from the exhausting air with the removal rate measured in parts per million (ppm) or weight removed per unit time.

ODOR CONTROL OVERVIEW

Odor control typically involves the introduction of a liquid aerosol, or atomized product, into the process air. This occasionally includes the use of fragranced agents that attempt to overlay a pleasant odor onto the malodor to “mask” the malodor. It is inaccurate to define masking agents as “odor control” because they cover odors, not remove them.

A safe, efficient, cost-effective odor control solution is using plant oil technology to neutralize odor molecules. With this technology, malodors are made undetectable by olfactory senses, and may also result in some reduction of emissions.

REGULATIONS & MEASUREMENT

EMISSIONS AND ODOR REGULATIONS

For many decades, the Environmental Protection Agency (EPA) has focused on industrial emissions and methods for controlling them. It has developed limits and standards for new and existing facilities and processes. Because of this attention, instruments and techniques for measuring and limiting emissions have been around for many years.

Nearly all processes create emissions. And many emissions create odors. But while controlling emissions and malodors are related, they can require individual solutions.

In comparison, odor control has only recently reached the attention of the EPA. Society-at-large has also become more aware and interested in reducing odors from many sources. There are **no federal standards for odors** in the United States. Any standards which exist are created by state and local municipalities.

ODOR MEASUREMENT

There have been attempts to use emissions sensors to measure odors, but these have largely failed. Most industrial processes produce a cocktail of many chemicals which makes this measurement complex and difficult. Some industrial chemicals smell bad and some do not.

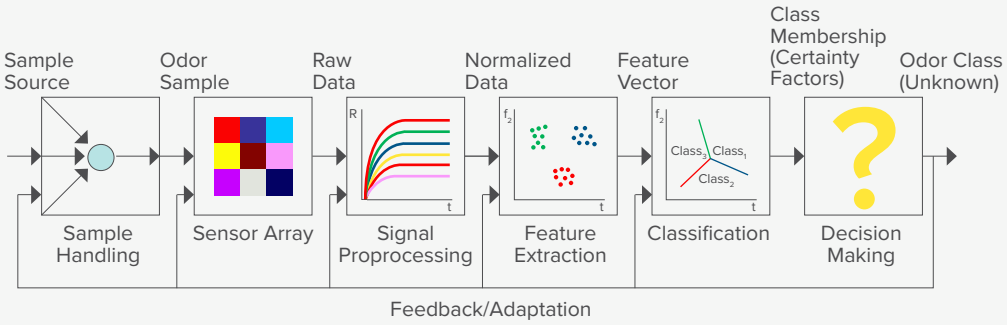
This is one of the reasons why Ecosorb engineers emphasize analysis of field samples from each location. Through field samples, we can **tailor a custom solution blend** that will be most effective at neutralizing each facility’s unique combination of malodor-producing chemicals.

For example, ammonia and hydrogen sulfide measurements were specified for a wastewater treatment plant as indicators of emission reduction. However, they are not the major contributors to malodor as other sulfur containing compounds (dimethyl disulfide and dimethyl sulfide).

E-Noses

In the research "Electronic Taste and Smell: The Case for Performance Standards," [1] Dr. Troy Nagle (North Carolina State University professor) and Dr. Susan Schiffman (former Duke University professor) explain the many factors of odor measurement. Both are recognized experts in the international community of odor measurement and leaders in the IEEE—the world's largest technical professional organization dedicated to advancing technology.

Together they now head up an IEEE subcommittee charged with developing much needed standards for electronic noses—devices designed to detect and evaluate odors and tastes.



E-nose sampling and signal processing. From "Electronic Taste and Smell: The Case for Performance Standards."[1]

SUMMARY OF FINDINGS

There are no formal standards for e-noses.
Until there are, there will be little improvement in their performance or the correction of fundamental flaws.

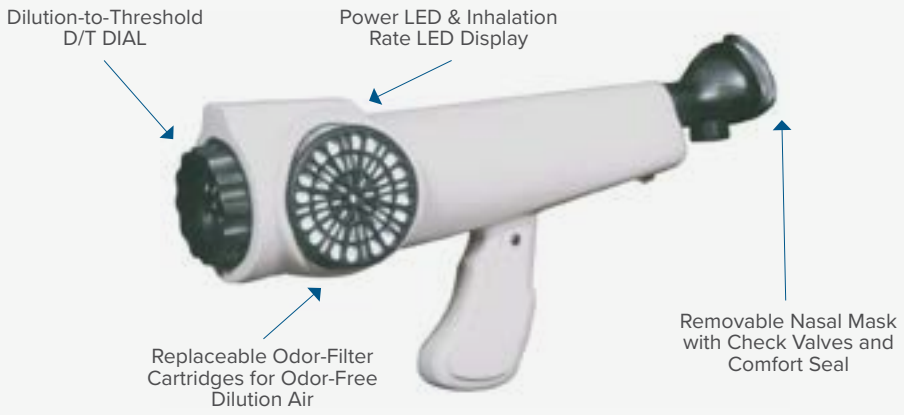
An e-nose will be no substitute for the human nose.
The human nose can distinguish hundreds of thousands of odors and great variations in intensity. Human noses are usually preferred, especially in critical applications such as industrial malodors.

E-noses cannot reliably identify odors in multi-component samples.
Even after years of independent, but commercially motivated development, it is still not possible to reliably identify odors in samples with multiple, complicated components.

E-noses rely on clusters of sensitive, but not "smart," electronic sensors.
The common e-nose is made up of a cluster (approximately 32) of electronic sensors (like MOX). Each sensor responds to a volatile with a change in resistance or current. The sensor itself does not know the chemical composition of the volatile. However, it can be calibrated for a given volatile. If only one of the 32 sensors become damaged, the cluster can no longer correctly identify the odor. Individual sensors are easily damaged by acid air, abuse or simply age.

An e-nose is best used in controlled settings and needs consistent maintenance.
The E-nose does not like the rigors of the field. It prefers a lab environment. It does not like strong signals nor long exposures to even low signals. They cannot respond to very low signals consistently. An e-nose is prone to saturation and drift. It requires constant re-calibration.

Nasal Ranger
The standard odor measurement device for the U.S. wastewater treatment industry is the Nasal Ranger—which Ecosorb may recommend for critical applications. The Nasal Ranger is a field olfactometer for measuring and quantifying the odor strength in ambient air. Each device creates a calibrated series of discrete dilutions by mixing odorous ambient air with odor-free, carbon-filtered air. Each dilution level is defined as the dilution-to-threshold ratio.



Scientists test with the Nasal Ranger by turning the dilution level dial until an odor is detected. It uses the human nose to accurately and repeatably measure an odor in terms of odor units (OU). The usual standard is 7.0 OU. Ecosorb is capable of achieving this level of performance in many environments. It is a much more meaningful standard than elemental ppm or ppb.

A certified technician might make a survey once or twice a week, keep records, and correlate with any real or imagined complaints. The Nasal Ranger is not electronic, so it does not communicate with recorders and controllers. However, it is possible (after a period) to use a simple and reliable electronic instrument to roughly correlate with Nasal Ranger findings. Because of this, an electronic alarm or control functions may be made.

Nasal Ranger vs. E-Nose
As with any technology, both the Nasal Ranger and e-nose devices have advantages and disadvantages.

	Nasal Ranger	E-Noses
Electronic / Manual	Not electronic; relies on a human nose	Electronic device using sensors
Reliability	Highly accepted for years	Still a work in progress
Expertise Required	Only individuals that pass an n-butanol standard should use	What sensors to use, what the sensors measure, and keeping the sensors working
Maintenance	The human nose needs rest periods to be effective, by leaving area or using a respirator	Needs frequent calibration; conditions in the field make it hard to keep e-noses running

ABOUT ECOSORB TECHNOLOGY & EXPERTISE

The experienced team at Ecosorb uses its knowledge in odor measurement to create effective odor control applications. Our ties to research, academia, and science keeps us at the edge of innovation, especially in new techniques for measuring and controlling odors.

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.

GET STARTED

To learn more about Ecosorb solutions and equipment, visit **EcosorbIndustrial.com** or contact us at **800-662-6367.**

SOURCES

[1] H. Troy Nagle and S. S. Schiffman, “Electronic Taste and Smell: The Case for Performance Standards,” Proceedings of the IEEE, Vol. 106, No. 9, pp. 1471-1478, Sept. 2018