

Introduction to ODOROX HYDROXYL Technology



Solutions for Mold Control



INTRODUCTION TO ODOROX HYDROXYL TECHNOLOGY

“Neutralizing Harmful Gases and Micro-Organisms the Natural Way”

The ODOROX Hydroxyl Generator is a complete odor elimination, air decontamination and purification system. The manufacturer, HGI Industries Inc., is a U.S. based company whose hydroxyl technology is at the forefront of high-volume air processing. They have generators that range from residential, to commercial, to industrial and agricultural applications. There is no job too large that these systems can't handle.



Figure 1 Portable Hydroxyl Generator

The ODOROX Generators use a two part treatment process to eliminate a long list of biological and chemical pollutants. One part involves directing air through a sanitizing chamber. This chamber harnesses multiple nanometer wavelength and frequency ranges. The first segment of the optics deodorizes the air flow, while the second segment destroys bacteria and other micro-organisms and prevents them from multiplying. The result is purified air which is then channeled back into the environment. These wavelengths also combine with ambient air humidity to create hydroxyls, which are the key to the second part of the decontamination process.

Hydroxyls (-OH molecules) occur naturally in our atmosphere when sunlight hits water vapor. They are so small that ten billion-billion would fit into a drop of rain. Despite their diminutive size, hydroxyls are probably the single most important cleansing agent within our environment. Hydroxyls are:

- 33% more effective at oxidizing pollutants in the air than ozone, and
- 2.5 times more germicidal and fungicidal than chlorine.

This makes them the most effective method of eliminating bacteria, viruses, germs, mold, volatile organic compounds (VOC's), chemical fumes, gasses, vapors and unpleasant odors that you can buy. The problem is that hydroxyls are not naturally occurring indoors, therefore, due to the absence of the hydroxyls, indoor air quality is said to be 10 to 100 times more polluted than outside air.



Figure 2 Elimination of Mold Due to a Water Leak at a Library

The Environmental Protection Agency states,

“...people spend approximately 90 percent of their time indoors. Thus, for many people, the risks to health may be greater due to exposure to air pollution indoors than outdoors.”

This helps explain why chronic lung disease affects over 35 million Americans and is the third leading cause of death in the United States. Asthma alone affects about 20 million Americans, 6.3 million of which are children. Annual health-care costs for acute respiratory infections resulted in:

- Approximately \$30 billion in annual health care costs
- Another \$35 billion in annual sick leave

The U.S. Department of Energy reports that improving buildings and indoor environments could reduce these costs and increase worker performance for an estimated productivity gain of \$30 - \$150 billion annually. Sick Building Syndrome, Multiple Chemical Sensitivities, Chronic Fatigue Syndrome, challenged immune systems and asthma are just a few of the challenges we face today. The ODOROX Hydroxyl Generator can help battle these problems.

By mimicking the natural production of hydroxyls in the atmosphere, this technology will help to create a safe indoor environment for all who desire a healthy lifestyle. The ODOROX clean air systems are:

- Not hazardous to people or pets
- Generate no accumulative ozone (<0.01 ppm)
- Use no harsh chemicals
- Require only low maintenance
- Uses very little power.

The hydroxyls produced are clearly a vital component to clean air, and it is no wonder they are often referred to as “Mother Nature’s Broom”. Now, because of the ODOROX Hydroxyl Generators, we can all experience cleaner and fresher air in our indoor environment as well.

See the following pages for frequently asked questions and answers regarding ODOROX Generators.

Frequently Asked Questions about Hydroxyls

WHAT IS THE SCIENCE BEHIND THE ODOROX CONCEPT?

ODOROX Generators are new to the field of cleaning and indoor air quality. However the underlying scientific principles have been around for more than a century. UV disinfection protocols have been in common use in hospitals and in the food processing sector for many years. More recently, hydroxyl generation has been used as one solution to the 'Sick Building Syndrome', dramatically improving the levels of indoor air quality (typically through duct system installations).

The website of Penn State University School of Aerobiological Engineering¹ provides a good reference source of studies that deal with UV applications (sometimes in conjunction with filtration) and systems design. The goal being to combat poor IAQ which would include, mold infestations and anthrax bio-terrorism. Through the ODOROX Generators, we have taken this proven and safe core technology and placed it into a practical, cost effective form that for the first time gives the user mobility and high-volume air processing/decontamination capacity.

HOW DOES THE ODOROX DECONTAMINATION SYSTEM WORK?

The ODOROX approach is based on a rarity in the industry, a multi-nanometer optical device that incorporates clearly defined zones within it. Each zone produces a different nanometer frequency simultaneously. The later is an important feature as this is how we ensure that no harmful ozone is produced (this may happen with single frequency optics). Another crucial component of the ODOROX approach is the addition of correct, air-handling capacity. This is achieved by the inclusion of high efficiency fans on portable generators and optimal design criteria for engineered, permanently installed generators.

One ODOROX Generator frequency disinfects indoor air from bacteria, viruses and fungi (including mold spores). An optimizing, fully reflective tunnel, assures that there is maximum effectiveness of the electron energy that is used to neutralize these bio-hazards. There are established protocols to calculate the air speed, light intensity and exposure times for mold species within a given or designed air volume. This chemical-free disinfection/decontamination system leaves no byproducts behind. All mold spores and particulate are rendered inert and ready for capture in our custom filter blocks provided in our mold-abatement models.

Another frequency deodorizes by means of the production of a quick-acting, yet mild anti-oxidant. This anti-oxidant is injected into the air stream as it passes through the reactor chamber. The electron energy serves as a catalyst to break apart ambient water molecules. This process yields hydroxyls that react with the chemical bonds of more complex molecules in odorless gasses such as solvents and VOC's (volatile organic compounds). The process is referred to as photo-catalytic oxidation. Photo-catalytic oxidation rids indoor air and porous surfaces (such as fabric, wood and cement) of volatile contaminants.

¹ www.engr.psu.edu/ae/iec/abe/index.asp

HOW AND TO WHAT EXTENT DOES THE ODOROX PROCESS DEAL WITH MOLD AND ITS RELATED ISSUES?

There are a number of applications within the fire and flood, carpet/upholstery cleaning and indoor air purification sectors in which the efficacy of ODOROX decontamination systems are relatively easy to show; mold remediation is a more complex issue, both technically and legally. A number of nuances and precautions are now involved.

At this writing, experts, scientists and government agencies, with all their academic and financial resources cannot reach consensus in the area of mold abatement. We all have the option of waiting years until an unlikely consensus is achieved. However modest and limited, we have chosen to be proactive in our contribution to solving the mold issue. In fact, there is no one tool or technique available today that can claim to be a full solution.

The main challenge is that the mold issue is not unidirectional. One must consider and address every one of these following facets:

- The origin of the problem
- Conditions enabling the mold to grow
- The effects of mold presence
- Remediation of the existing mold
- Prevention of recurrence

Molds require a number of conditions in order to thrive and reproduce:

- An organic food source
- Moisture
- Ideal temperature
- Stagnant air
- A mechanism to reproduce and spread about

Active (and/or decaying) mold secretes the characteristic musty odor and toxic off gassing known as mycotoxins which include metabolic volatile organic compounds, or mVOCs. Many experts agree that it is precisely these noxious fumes as well as the accompanying particulate debris (also of mold origin e.g. mold spores and cell fragments), that cause the majority of health problems including allergic reactions in humans.

Dr. Charlene Bayer, from the Georgia Institute of Technology's Indoor Environment Research Program stated:

“As molds and fungi grow, they give off metabolic gasses that contain VOC emissions. Many of the volatile compounds produced are identical to those originating from solvent-based building materials and cleaning supplies. These VOCs include hexane, ethylene chloride, benzene and

acetone ... The microbial VOCs may contribute heavily to the overall level of ambient VOCs in buildings.”

There are a variety of resources about mold on the Web that mention these very same points. See for example www.themoldsource.com. See also “Where does Mold Grow”, North Carolina State University website: www.epi.state.nc.us/epi/oii/mold/grow.html

The ODOROX System interferes with mold living conditions.

Food source: By sterilizing the ambient air ODOROX Generators break the food chain of mold strains that feed on airborne microorganisms or loose organic materials (such as dust mite feces, fibers, dead skin cells and generally, bacteria and their bio-films). The airborne hydroxyls also appear to disrupt the chemical composition of the molds’ external digestive enzymes. Fungal cells exude these toxic enzymes that attack the cellular structure of food and reduce it to a fluid that is absorbed by the mold cell wall. More study is required to definitively prove these claims.

Ambient: On its own, or in combination with complementary restoration equipment, such as air blowers and injectors, ODOROX Generators interfere with conditions that promote mold growth. Some conditions that ODOROX Generators disrupt include moisture, temperature and stagnation by the effect of air movement and drying.

Reproduction: Airborne spores are zapped directly as they are processed through the ODOROX refractive tunnel. This interferes with molds’ most effective mode of multiplication. Inert spores however, may still hold potential for allergic/irritating affects. This means that for optimal protection the use of filters after hydroxyl treatment may be in order to trap the offending particulate.

Mycotoxins: mVOCs and their related musty odors are broken down by photo-catalytic oxidation of their molecules, under this effect of the hydroxyl process. ODOROX Generators produce a stream of oxidizing, short-lived (negative) -OH molecules.

The life and reproductive cycle of simple organisms is short. Mold can turn a clean water release into polluted water in days if left unchecked. This same short life cycle also means that if you withhold ideal growing conditions, you will increase your chances of quickly stunting mold proliferation. To achieve initial mold and mold spore mortality, we recommend four to five days of continuous generator operation.

Standard restoration work still has to proceed, for the physical removal of the dead mold. Other work may be required to eliminate the source of the problem (say the original water leak). Once the hydroxyl treatment and cleaning is complete, the building will be fine for as long as NO NEW CONTAMINATION is brought into the building. If there is a high likelihood of recurrence, a permanent ODOROX air-decontamination solution should be installed.

IS ODOROX SOME KIND OF “SILVER BULLET” SOLUTION?

No equipment can solve 100% of air quality issues. The level of success with hydroxyl air treatment will vary according to local circumstances. Standard cleaning techniques may be required in some cases to complete the task at hand. Furthermore, normal procedural precautions should be maintained. For example, when bringing down a wall, please remember that mold spores, even when inert, conserve toxicity and allergic capacities.

HOW LONG SHOULD ODOROX GENERATORS STAY ACTIVE AT THE JOB SITE IN ORDER TO BE ASSURED THAT THE DECONTAMINATION CYCLE HAS BEEN COMPLETED?

For optimal results, ODOROX Generators need to be present on the job site as early as possible. We recommend four to five days of generator operation. We further recommend the use of more than a single generator per job. To further assist you, use auxiliary equipment, such as air injectors (for walls) or extra air movers; always reduce or remove the contaminant source as soon as possible.

The type and number of ODOROX Generators required for each kind of restoration work are as follows:

- The size of the area to be treated.
- Determine whether the source of contamination has been effectively removed or not.
- The contamination type-is it particulate or a gas? Filter or no-filter options.
- Odor intensity-if of higher intensity utilize generators with a more optic capacity.
- Odor age or persistence; accumulated, ingrained odors require more time and additional consideration.
- The configuration of the room or structures that may hamper efficient air flow; potentially use multiple, smaller generators and auxiliary air movement.

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