



TECHNOLOGY NOTES

SecureAire's ACS System and Cannabis Grow Facilities

The SecureAire Advanced Collector System (ACS) is a very efficient and effective air purification system that utilizes Particle Control Technology. It is composed of three parts, a Particle Conditioning System, a Collector System and a Collider System. These three parts together create today's single most efficient and effective particle control entity.

The ACS optimizes both ionization and polarization to collect small particles, TVOCs and gases very effectively. Unlike conventional filters the ACS, with its electronic characteristics, exhibits superior performance and is non-selective in reducing and/or removing all types of contaminants. The ACS conditions contaminants to adhere to the media material or other particles, which subsequently get captured. Utilizing and optimizing electric fields and charge to ionize/polarize contaminants as well as polarize the internal media material in the system, results in a significant reduction in airborne contamination. The ACS System also provides the critical aspect of pathogen inactivation through the use of INACTIVATE™ Technology. INACTIVATE reduces viable organisms' ability to grow and provides the necessary voltage strength to oxidize and kill viable airborne pathogens including mold.

Initially, SecureAire used Particle Accelerated Collision Technology (PACT) to agglomerate particles, as well as condition particles to adsorb and absorb gases and odors in the room environment. These particle agglomerates are then brought back to the HVAC filter where they were captured. PACT is utilized to make any filter more effective.

Today, as part of the ACS System, the Collider performs this same function. However, by combining the Collider with the PCU and Collector, the ACS System not only agglomerates but, very effectively collects, adsorbs, adsorbs and inactivates these particles, gases, TVOCs, odors and viable airborne pathogens.

Cannabis Characteristics

It is not commonly known that Tetrahydrocannabinol (THC), the main active ingredient of cannabis is odorless. Terpenes and/or Terpenoids, are the compounds that give the plant its unique smell, which is a major concern for cannabis grow facilities.

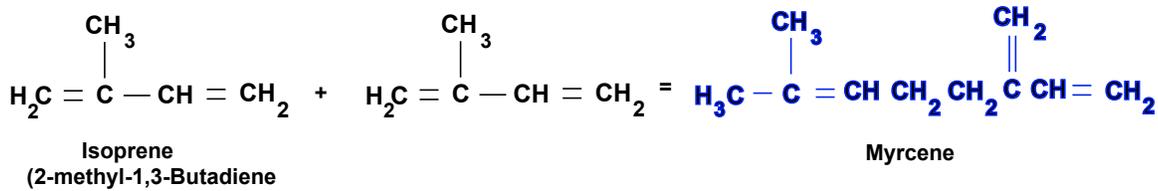
Terpenes are:

1. Ubiquitous throughout the natural world. Produced by countless plant species, terpenes are prevalent in fruits, vegetables, herbs, spices, and other botanicals.
2. Scientists have identified and characterized the molecular structure of some 20,000 terpenes, which compose the largest category of plant chemicals. These can be further broken down into mono-terpenes, diterpenes and sesquiterpenes, depending on the number of repeating units of a five-carbon molecule called isoprene, the structural hallmark of all terpenoid compounds.
3. Terpenes are volatile organic molecules (VOCs) that evaporate easily and readily announce themselves to the nose.

Chemistry and Understanding

Terpenes are a diverse group of organic Hydrocarbons (C_5H_8), produced by a wide variety of plants. They are the important building blocks for the odors, pigments, resins, essential oils, and cannabinoids of the marijuana plant. There are over 120 different terpenes created by cannabis, however, most of them are in trace amounts. The most prevalent is Myrcene, which is made up of two isoprene units (monoterpene).

To show how Myrcene is synthesized from two isoprene groups:

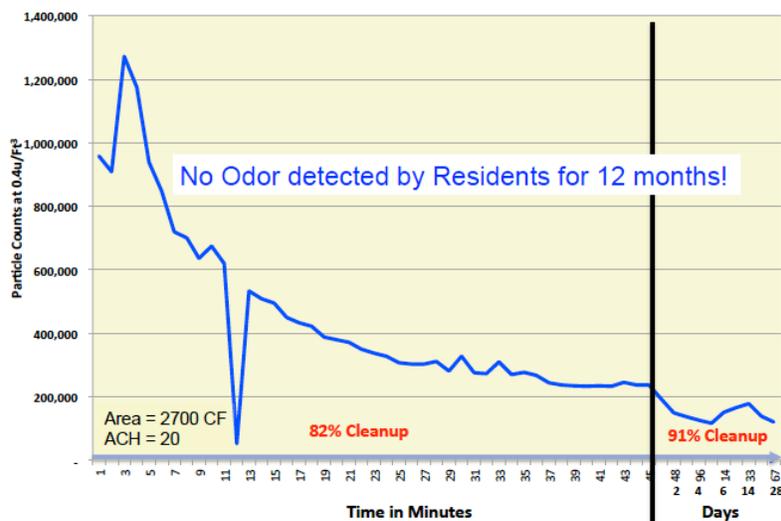


Note: The other two important groups of Terpenes that are created by cannabis are sesquiterpene (3 isoprene groups) and diterpenes (4 isoprene groups).

The important point here is that terpenes are made up of five carbon isoprene groups, which make them Volatile Organic Compounds (VOCs). Just like all VOCs, they are very susceptible to combining with other particles in the occupied space by absorption and adsorption.

Grow Facility Results

SecureAire's ACS Technology has helped to minimize airborne contamination levels within Cannabis grow facilities for some time. Particle count data taken from a private facility over a span of nearly two years has produced results that support the scientific understanding of Terpenes and a reduced and controlled particle environment. Within this controlled environment, any captured viable airborne pathogens (viruses, bacteria, mold, or spores) have been inactivated.



Colorado Cannabis Grow Facility



Terpenes can be ionized under the influence of the strong electric fields as produced by the ACS System, just like any other particle. Like all VOCs, terpenes are capable of undergoing polarization in a strong electric field. When this occurs, electrons are pushed in one direction and nuclei in the other, resulting in a charge separation and hence polarization in response to the applied field.

Once terpenes become polarizable in the ACS Collector they are attracted to the media material and to any other particle with an opposite charge. In other words, the probability of ionic bonding and polarizability is dramatically increased thus creating a very efficient particle control environment.

Summary

Today's Cannabis Grow Facilities face airborne contamination challenges similar to those of critical indoor environments such as Healthcare, Research Laboratories and Cleanrooms to name a few. With an in-depth understanding of these contamination control issues, Grow Facilities can now employ the appropriate particle control solution while utilizing sufficient airflow rates for optimum results and indoor air cleanliness.

In summary, terpenes (VOCs) that have been exposed to a SecureAire ACS System can:

1. Absorb and adsorb onto other particles in the occupied space.
2. Be ionized in the ACS PCU and transported to the ACS Collector.
3. Due to their polarizability in the ACS Collector, they will be collected within the media material.

Also, any viable mold or spores, that have been captured by the ACS System will be inactivated through the use of INACTIVATE Technology.

The simple principle of creating polar molecules and charged particles is the basis for SecureAire's Particle Control Technology Platforms. The ability of SecureAire's ACS System to treat terpene contamination is no different than previously documented case studies where the removal, reduction and inactivation of TVOC's, dissolved gases, smoke, odors and particles has been achieved. Furthermore, SecureAire's Particle Control Technology is "non selective", which means that the source of the airborne contaminant is simply treated as a contaminant and will be removed.

For further information, please feel free to contact your local SecureAire Representative.