

Appendix - F

Cannabis Odor Control

Supplemental Odor Control Technology Research Summary

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Supplemental Odor Control Technology Research

Introduction and Overview

Effective technologies exist to suppress cannabis malodors. Activated carbon filtration systems have been proven to be effective for indoor cannabis facilities by Denver's Department of Environmental Health. Vapor-phase systems have been proven to be effective for outdoor odor mitigation by the City of San Diego's Department of Environmental Services, Air Pollution Control District, and Solid Waste Local Enforcement Agency, as well as greenhouse cultivation by established greenhouse growers in Carpinteria. These technologies could be implemented to effectively reduce cannabis malodors in Santa Barbara County.

Additionally, counties have implemented agriculture buffer requirements which serve in part to reduce land use conflicts which arise from odors. Buffer requirements may be a useful strategy for cannabis odor mitigation within the County where neighboring land uses are far apart. Anecdotal evidence suggests that strong cannabis odors can still be detected large distances away from the source. Thus, buffers may be utilized but are likely to be more effective remote areas of the County where larger buffer distances could be implemented. In more urban areas, odor mitigation technologies would be more appropriate as they would significantly reduce odors over a shorter distance.

Activated Carbon Filtration

Ventilation System

In this system, odor causing agents are adsorbed and filtered through activated carbon (Pennsylvania State University 2002). Odorous gas from the operation facility is collected via a ventilation system. Blowers then direct the gasses to the distribution system which uniformly delivers the gas to the filter. The filter sorbs and degrades the odors resulting in relatively odor-free exhaust.

Supporting Information and Current Usage

The City of Denver's Department of Environmental Health regulates nuisance odors under Denver Revised Municipal Code, Chapter 4 – Air Pollution Control, Section 4-10. Under this rule, an odor control plan must be submitted 1) describing any odors anticipated to originate from the premises of marijuana growing, processing, and manufacturing facilities and 2) describing control technologies that will be used to prevent odors from leaving the premises (City and County of Denver 2017). The Department of Environmental Health states the, "rule recognizes carbon filtration as the current best control technology for marijuana cultivation and marijuana infused product facilities" (Denver Department of Environmental Health 2017). However, other odor control technologies are permitted so long as it can be demonstrated that the technology can effectively mitigate odors.

The Director of the Environmental Quality Division of Denver's Department of Environmental Health (Denver Director) was contacted by phone on November 30, 2017 to discuss how effective carbon filtration is, where it has been applied, and if it had the potential to impact product quality. The Denver Director stated that approximately 60 percent of indoor grow operations in Denver had installed odor mitigation control prior to the rule, and that 98 percent of those who installed odor mitigation had utilized carbon filtration. In creating the rule, input from indoor grow operators and HVAC control technicians was included to ensure the regulations would reflect technical and economic feasibility.

City officials toured the cultivation facilities to determine the effectiveness of the carbon filtration technology. City officials determined that carbon filtration was effective in removing odors. However, the Denver Director stated that carbon filtration is only effective for processing facilities and indoor grows, which was the only type of cultivation facility in Denver at the time of the ruling. The Denver Director noted that the initial cost of investment for a carbon filtration system is \$10,000-\$15,000 for a medium-sized 10,000 square foot indoor facility with an additional \$2,000-\$3,000 per year in operation and management costs. The Denver Director also stated that the carbon filtration technology would not impact the quality of the cannabis. Finally, the Denver Director stated that the quality of cannabis would only be impacted if the HVAC system, not the carbon filtration system, malfunctioned and humidity was not properly controlled.

A grower in Carpinteria was contacted by phone on November 19, 2017. The grower utilizes vapor-phase technology (discussed below) to mitigate cannabis odors from his greenhouse in Carpinteria. He had considered carbon filtration, but stated that he did not use it because he would not have been able to control the internal environment of his greenhouse. The grower noted that carbon filtration would be appropriate for manufacturing, indoor grows, drying rooms, and packaging.

A Code Compliance Officer for the Portland Cannabis Program (Portland Officer), stated that there is no specific odor requirement for the City of Portland. If odor complaints are made, then an action plan is required to reduce odors. Portland's Zoning Code Section 33.262.070 simply states that "continuous, frequent, or repetitive odors may not be produced" (City of Portland 2017a). Portland's code guide for cannabis businesses states that "all exhaust and relief air should be filtered or scrubbed" in order to comply with the zoning code (Portland Bureau of Development Services 2017). The Portland Officer stated that retailers, wholesalers, and processors use countertop carbon systems in order to mitigate odors. Large ventilation systems with activated carbon filters are used for indoor cultivation. These systems are scaled proportionately to the size of the facility. However, Portland does not currently have any greenhouses and the Portland Officer does not know of any odor mitigation strategies for greenhouses.

Canisters

Activated carbon ventilation systems which are supported by activated carbon gas canisters.

Supporting Information and Current Usage

The Director of the Planning and Development Department of the City/County of Pueblo, Colorado (Pueblo Director), was contacted by phone on December 1, 2017. The Pueblo Director stated that Pueblo only regulates odor for cannabis in industrial zones and that agricultural zones is exempt from cannabis odor mitigation. Pueblo County Code Title 17 Chapter 17.120.190 requires that all cannabis establishments in the central business zoning district (B-4) have odor mitigation. "The building (term includes buildings, greenhouses, and hoop houses) shall be equipped with a ventilation system with carbon filters sufficient in type and capacity to eliminate marijuana odors emanating from the interior to the exterior discernable by a reasonable person..." (County of Pueblo 2017).

The Pueblo Director stated that mitigate odors in greenhouses, some growers are using canisters with activated carbon inside to filter the air. This works similarly to the ventilation activated carbon systems used in indoor grows but can be used for greenhouses. The Pueblo Director and officials from the Department of Public Health and Environment plan to use an olfactometer to test the effectiveness of this technology in greenhouses on December 21st.

Vapor-Phase System

A manufacturer of this technology as it specifically applies to cannabis was contacted. As described, a deodorizing liquid comprised of essential oils in the citrus and pine family are placed inside a vaporizing mechanism. The vapor travels through a distribution pipe that is suspended high up in the greenhouse and runs along its entire perimeter. The vapor escapes from holes in the distribution pipe and a curtain a vapor along the perimeter is produced. The vapor interacts with and changes the chemistry of cannabis malodors. Because of this chemistry change, the olfactory receptors in the human nose no longer interprets the smell as a malodor. The result is an odor-neutralizing, not an odor-masking technology. The interviewed manufacturer had a third-party consultant perform a public health and safety assessment for their specific cannabis deodorizer. Acute inhalation studies were performed and the product was evaluated against health criteria developed by regulatory agencies such as the USEPA. This particular manufacturer's cannabis deodorizer met all applicable health criteria thresholds (CPF Associates, Inc. 2017).

In Pueblo Colorado, some growers are using this technology to mitigate the cannabis odor emitted from greenhouse fan exhaust. The Pueblo Director and officials from the Department of Public Health and Environment plan to use an olfactometer to test the effectiveness of this technology in neutralizing the odors from greenhouse fan exhaust on December 21st.

The Landfill Operations Program Manager for the City of San Diego's Department of Environmental Services (San Diego Manager), was contacted by phone on November 30, 2017. The San Diego Manager stated that the City of San Diego uses the technology produced by the interviewed manufacturer, but uses a different blend of the same essential oils that is specific to the malodors resulting from landfills. The San Diego Manger, along with the San Diego Air Pollution Control District (APCD) and the Solid Waste Local Enforcement Agency (LEA), performed a pilot study of the technology's effectiveness at the Miramar landfill. The San Diego Manger noted that he, along with the officials from APCD and LEA, could not smell the landfill within 25-30 feet of the device and that the technology was effective in reducing odor in nearby communities. These communities are the nearest sensitive receptor and are located one mile away from the landfill on the other side of a highway. The San Diego Manager stated that the odor mitigation technology is only effective when the device was downwind of the source of the malodors and between the source of the malodor and sensitive receptors. Because wind direction changes during the day, the landfill uses other odor mitigation strategies (e.g., covers) in addition to the vapor-phase technology. The San Diego Manager mentioned that the technology would be more effective in an enclosed area (e.g., greenhouse), because wind direction would not have to be considered and the vapor would be closer to the odor source, and therefore, would have a greater likelihood of interacting with and neutralizing the malodors. Like the grower in Carpinteria, the San Diego Manager stated that the vapor had a pine scent, but that this scent was only noticeable when too much vapor is being produced. He stated that reducing the amount of vapor leaving the system was effective in reducing the pine scent.

A grower in Carpinteria was contacted by phone on November 29, 2017, and stated that the scent of cannabis is no longer noticeable at a distance of 50 feet from the greenhouse when this technology is used. However, the grower stated that the liquid and resulting vapor has a pine/citrus scent, which can be noticeable if too much vapor is being produced. If this occurs, it was stated that the amount of vapor produced by the system can be reduced.

Buffer Zones

Odors dissipate with increasing distance away from the odor source. Therefore, buffer zones are sometimes utilized as a strategy to mitigate odors. Other jurisdictions have implemented buffer zones for cannabis. The State of Washington has buffer requirements that apply to all cannabis businesses and protect sensitive receptors. Such buffer requirements could be applied to protect residential areas in the County of Santa Barbara. The State of Washington requires a 1,000-foot buffer zone between any type of cannabis business and sensitive uses such as an elementary or secondary school, playground, recreation center or facility, child care center, public park, public transit center, or game arcade (Washington State Liquor and Cannabis Board 2017). However, recent legislation allows local governments, like the City of Seattle, to reduce the buffer to 100 feet, except for elementary and secondary schools and public playgrounds (Washington State Liquor and Cannabis Board 2017).

The City of Seattle has buffer requirements for both retail and non-retail cannabis businesses such as cannabis cultivators. The City of Seattle requires a buffer zone of 1,000 feet from sensitive receptors such as elementary schools, secondary schools, and playgrounds for all cannabis businesses (Seattle City Council 2016). A 500-foot buffer from child care centers, game arcades, libraries, public parks, public transit centers, or recreation centers or facilities is required for cannabis retail businesses while a 250-foot buffer is required for non-retail cannabis businesses. Additionally, a 350-foot buffer must be maintained between cannabis retail businesses. Meanwhile, the City of Portland only requires buffers for cannabis retailers and retail couriers, which does not include cannabis cultivators (City of Portland 2017b). For cannabis retailers, a 1,000-foot buffer is required from schools, retailers, and dispensaries. For cannabis retail couriers, a 1,000-foot buffer is required from schools.

Like the State of Washington, the State of California also requires buffer zones for both retail and non-retail businesses such as cannabis cultivators. California state law requires cannabis businesses, including cannabis cultivators, to not be located within a 600-foot radius of any school providing instruction for kindergarten or any grades 1-12, day care center, or youth center. However, an exception may be made if the cannabis business has a valid license or permit from a local jurisdiction, is compliant with local ordinances and regulations, and the cannabis business is not located such that people must pass through a business that sells alcohol or tobacco to access the cannabis business. Other cities within California, such as the City of Oakland, have followed the state's direction. In the City of Oakland, cannabis businesses, including cannabis cultivators, are required to have a 600-foot buffer for schools (City of Oakland 2017).

In addition to meeting state requirements, Santa Barbara County may consider proximity to sensitive areas, local climatic conditions, and local topography and barriers when establishing buffers (Pennsylvania State University 2002). Odor impact assessments used to establish robust buffer requirements for odors in general rely on complex mathematical models that involve 1) odor flow from the source 2) odor dilution in the atmosphere 3) peak concentrations that mimic odor detection by the human nose and 4) the probability that the odor exceeds an odor impact threshold at various distances from the odor source (Schauberger, G. and Piringler, M. 2012). However, such information is not available for the County of Santa Barbara.

In the absence of such detailed information, established buffer zones within the County of Santa Barbara and County of San Luis Obispo for similar land uses may serve as an example of effective buffer distances. Similarly to cannabis, agricultural crops are grown outdoors and in greenhouses and some have been noted for their disagreeable odor (e.g., garlic, cauliflower, broccoli). In the County of San Luis Obispo, buffer distance for agricultural uses depends on the type of crop and proximity to

dwellings (County of San Luis Obispo 2010). The buffer distance ranges from 100 feet to 300 feet for greenhouses, 100 feet to 400 feet for irrigated forage and field crops, 100 feet to 500 feet for wholesale nurseries outdoors, and 200 feet to 600 feet for irrigated vegetables and berries. For Santa Barbara County's 2013 Agricultural Buffer Ordinance was established to "minimize potential conflicts between agricultural and adjacent land uses that result from noise, dust, light, and odor incidental to normal agricultural operations as well as potential conflicts originating from residential and other non-agricultural uses" (County of Santa Barbara 2013). In commercial and industrial zones, the minimum buffer width is 100 feet and maximum buffer width is 300 feet. In residential not located on a small lot located within an urban area, the minimum is 200 feet and maximum 300 feet. In residential located on a small lot located within an urban area, the minimum is 100 feet and maximum 200 feet. For sensitive non-agricultural uses, the minimum is 300 feet and maximum 400 feet.

These agricultural buffers are not specific to cannabis. Anecdotal evidence suggests that strong cannabis odors can still be detected at least 600 feet away, though it has also been stated that the odor can be noticed from one to two miles away from the source. Thus, buffers may be utilized but are likely to be more effective remote areas of the County where larger buffer distances could be implemented. In more urban areas, odor mitigation technologies may be more appropriate as they would significantly reduce odors over a shorter distance (e.g., 50 feet for vapor-phase technologies).

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