Cannabis Cultivation as Good Neighbors:

A Comprehensive Approach to Odour Control

First Canadian Odour Conference

December 2018 Calgary, Alberta

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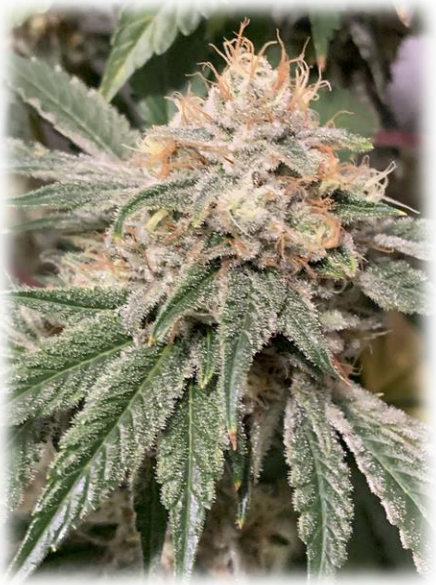


Agenda

- Lessons Learned Organics Processing
- Cannabis Overview
- Cannabis Odours
- Odour Sources
- Control Strategies

BIOREM Overview

- Oldest odour control company in North America (26 + years)
- Wastewater, Composting/Organic Processing, Rendering, Pet Food
- 1,200 installations in 23 countries
- Involved in some large and contentious projects
  - Ontario Rendering Plant (425,000 m3/h)
  - Guelph Composting (186,000 m3/h)
- Experience and financial strength to provide performance guarantees and bonding

Lessons Learned - Organics Processing

- Social Benefit
  - Organics Processing - Improves Environmental Sustainability, landfill diversion, low carbon intensity electricity and fuel, organic fertilizer
  - Cannabis Legalization – Eliminate Criminal Element, Better Product Quality, Tax Revenue, Social Justice
- Many got odour control right - proper design, selection of proven odour control equipment, good operation and maintenance
- However, there have also been many failures

Organics Processing in Ontario

Smelly Hamilton compost site will be shut down 'promptly,' says mayor

Controversial London composter hit with $1M fine is under other orders from province

Stinky company fined $250,000

Closure of Newmarket waste facility stinks for Toronto

London city hall: Residents plead for action against ‘offensive stink’

Organics Processing in BC

Richmond compost facility
Harvest Power to shut down

Richmond residents, council raising growing stink over 'unacceptable' stench from compost facility

Delta joins Metro Vancouver cities grappling with compost stench

Lessons Learned - Organics Processing

- Do it Right the First Time
- Always more costly to go back and retrofit
- Consider purpose built facilities, especially designed for the cultivation of cannabis
  - May be more costly in capital but lower operating costs, higher yields, shorter growth cycles, better quality
- Protect your Brand
- Consider odour control as an important piece of process equipment

Cannabis Cultivation

- Relatively new industry for Canada and select States in America
- In Canada, governed by Health Canada
- In Ontario, provincial environmental regulator has had limited involvement
- While Agricultural, many operations are in dense Urban areas and within Commercial and Industrial parks

Current Status

- Odour complaints becoming common as more operations are commissioned
- Neighbors, tenants, employees and regulators have all been making complaints
- In Canada, only about 180 in operation, with another 1700 applications under review

Design Considerations

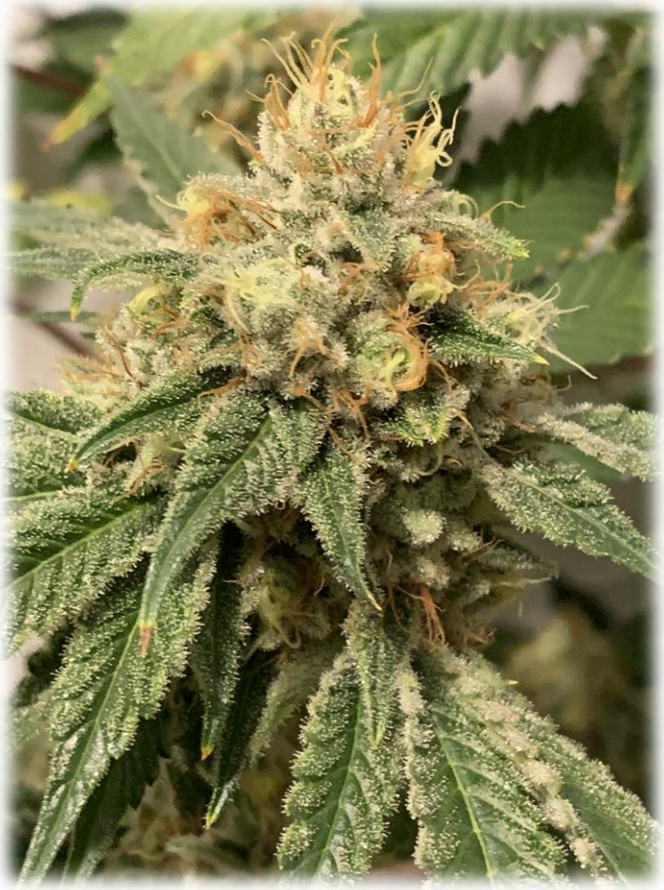
Established industries like sewage treatment, organics processing or rendering can help:

1. Odour Management Plans / Public Outreach
2. Proactive versus Reactive (**prevent first complaint**)
3. Proper HVAC Design
4. Proper Selection of Abatement Equipment

Cannabis Odour

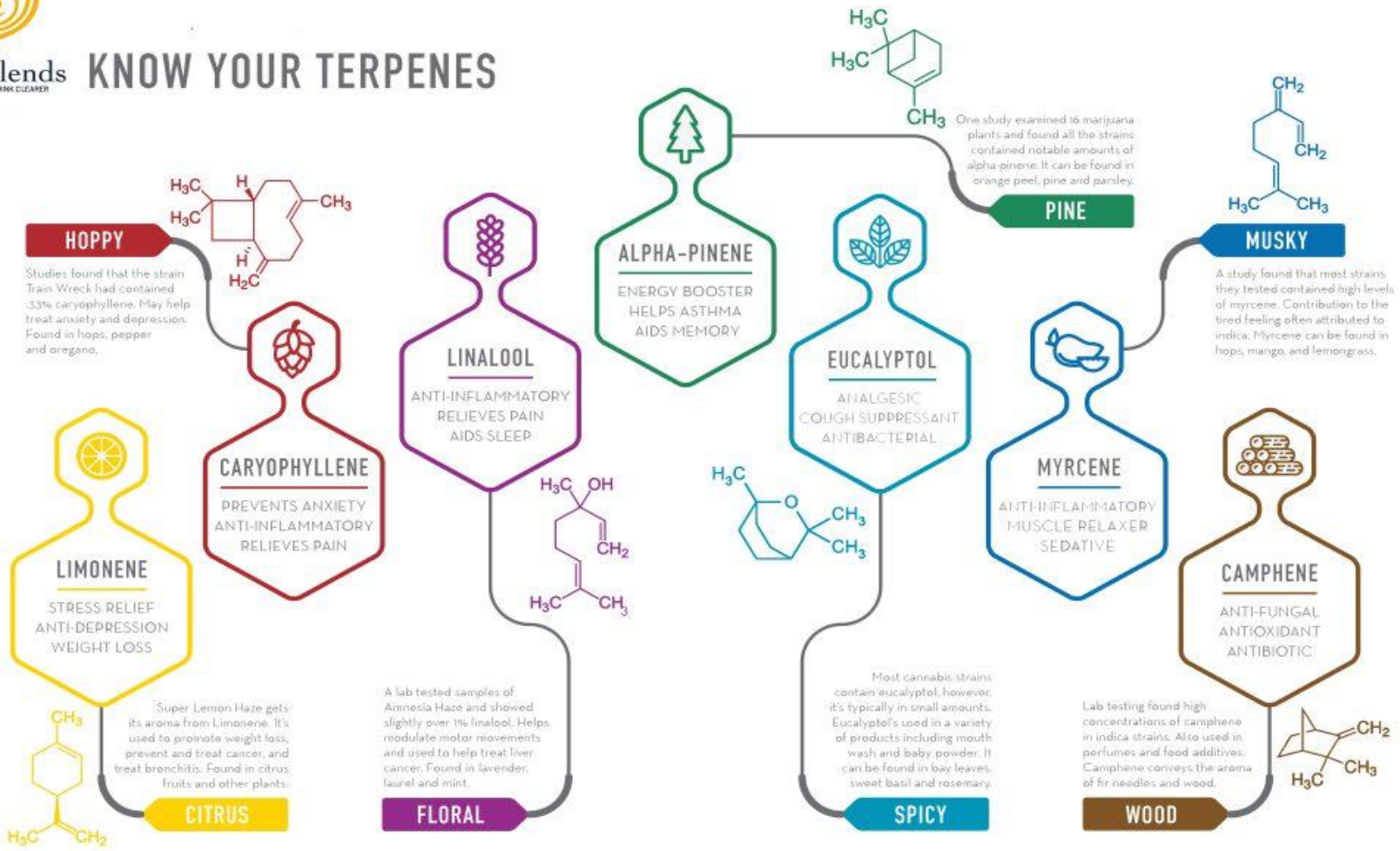
Complex Mixture of Volatile Organic Compounds (over 200 have been identified)

1. **Terpenes**
2. Aldehydes
3. Phenols
4. Alcohols
5. Organic Sulfur Compounds



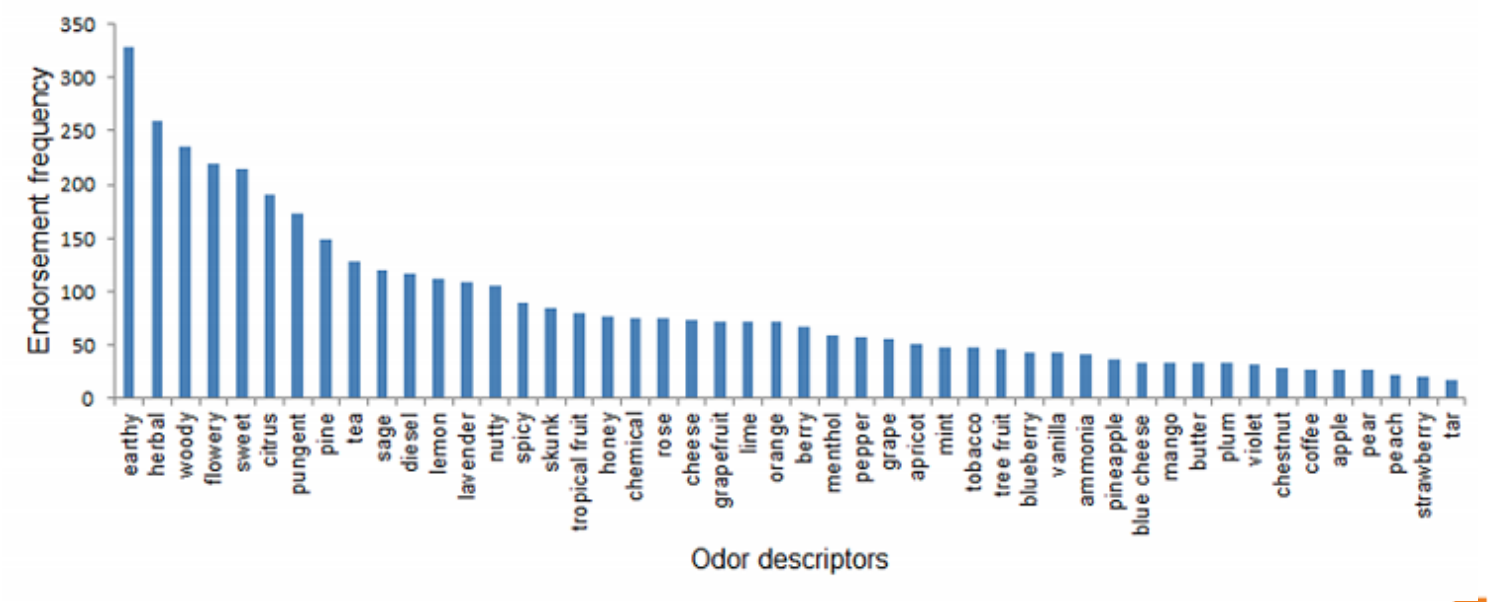
gloriblends
FEEL DEEPER THINK CLEARER

KNOW YOUR TERPENES



Cannabis Odour

The terpene and VOC profiles associated with Cannabis are responsible for the ‘bouquet’ and ‘flavour’ of the product



Odour Intensity

While concentrations of individual compounds are low, odour intensity can be quite pervasive and elevated

- Alpha-Pinene, Myrcene and Limonene are the predominant terpenes found to be within the range of 2 to 20 ppb
- tVOC ranges between 0.5 to 5 ppm
- Odour can be between 30,000 and 50,000 OU

(NOTE: samples retrieved from indica dominant hybrid flowering room at peak; ventilation at 4 ACPH)

Sources of Odour

High Intensity

- Flowering
- Trimming
- Drying
- Processing

Low Intensity

- Propagation
- Vegetative
- Waste Water
- Solid Waste

Common Cultivator Mistakes

- 100% air recycle: leads to fugitive emissions
- Poor ventilation feed and exhaust design
- Static pressure imbalances
- Air intake and exhaust point locations
- Use of hepa/carbon filter cartridges

Abatement Solutions

Activated Carbon Filtration

- Common approach

Advanced Biological Filtration

- Sustainable approach to emissions control

Activated Carbon Filter

- Low capital expense
- High operating expense

(energy, replacement media)

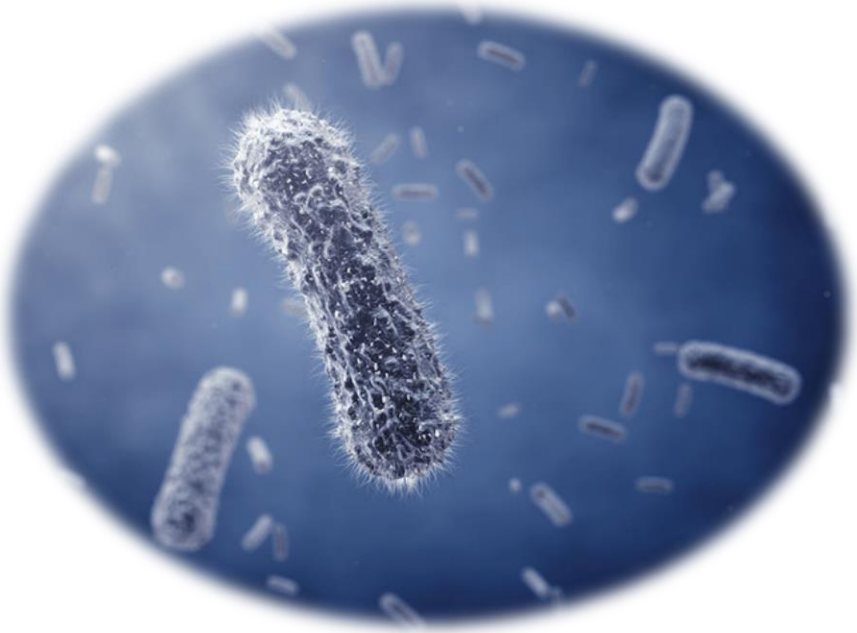
- Need to tailor the adsorbent to the air stream constituents
- Require a minimum of 2s retention time

Activated Carbon Filter

- The use of ‘furnace filter’ inserts is not recommended
- The small mass of carbon present is quickly consumed
- Humidity can negatively impact adsorption for these types of compounds

Advanced Biological Systems

- Fixed-film bioreactors for oxidation of the odour compounds
- The use of natural occurring bacteria and fungus
- Breaks down odours to CO2 and H2O
- Virtually zero operating expenses
- Performance over a wide variety of compounds



Advanced Biological Systems

- Ideally suited for moist, humid air streams
- High rates of destruction efficiency can be achieved
- No requirements for media replacement if using an ‘Engineered Media’ system

Conclusions

- Do it Right the First Time – try to prevent the first odour complaint
- Work with local odour consultants with knowledge of provincial / municipal requirements, preferably early during design
- Engage with regulators and community
- Identify the contaminants in your exhaust
- Consider odour control as an important piece of process equipment


Thank You
Any Questions?
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