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Air Quality Regulations

CWEA January 26th and 27th, 2010

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Presentation Topics

- Why are composting and thermal processes regulated?
- Composting rules
  - SJVAPCD Rule 4565
  - SCAQMD, Antelope Valley & Rule 1133
- UC Davis VOC research
- Dryer & thermal oxidation issues
- SJVAPCD & BAAQMD CEQA
- CWCCG

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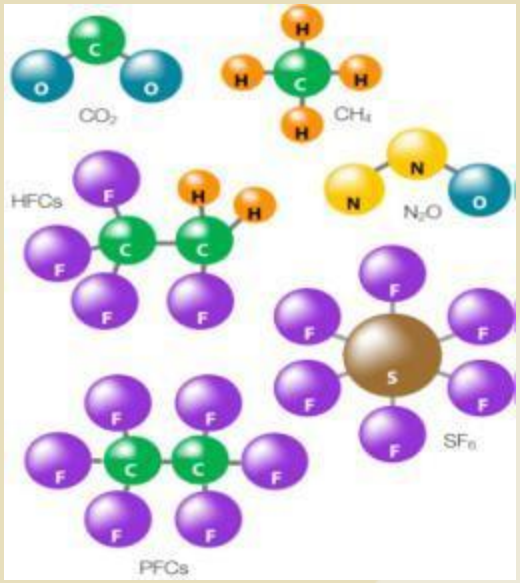
Most GHG Topics Not Covered…

- Background on GHGs
  - Warming potential
  - “Biogenic" v. “Anthropogenic” emissions
- POTW GHG Emissions Protocols & Estimates
- Mandatory Reporting
- AB 32 Overview
- Cap and Trade
  - Concept of additionality
  - Biosolids management options
  - Barriers to generating offsets
- Proposed Federal Legislation
- Proposed Federal Regulation (GHG Tailoring Rule)
- CWCCG’s efforts on behalf of California’s POTWs



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Challenges Driving Biosolids Management to "Facilities"

- Regulations restricting or banning both the land application and use of Class B biosolids as ADC
- Local restrictions (Solano & Kern counties)
- Limited landfill capacity (Especially in So Cal)
- Longer hauling distances to Class B sites (greater than 300 miles one way to sites in Arizona)
- Increasing costs for Class B land application (>$50/ton)
- Composting rules eliminating windrow composting
  - San Joaquin Valley APCD Rule 4565
  - South Coast AQMD Rule 1133

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But Why Regulate Compost & Thermal Technologies?

- The CAA requires EPA to set primary National Ambient Air Quality Standards (NAAQS) for criteria air pollutants that pose public health threats.
- Currently, NAAQS exist for six criteria pollutants -- ground level ozone, Particulate Matter, carbon monoxide, sulfur dioxide, lead and nitrogen dioxide.
- NAAQS are defined as the levels of air quality that is necessary to protect the public health.
- Ozone is formed by chemical reactions that require heat, sunlight, NOx from combustion sources & VOCs.
- Ammonia combines with NOx and SOx to form nitrate and sulfate particles, a component of PM pollution.

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Compost Emissions

- Emissions
  - VOCs
  - PM
  - NH_3

- Links to the regulations
  - http://www.arb.ca.gov/DRDB/SC/CURHTML/R1133-2.PDF
  - http://www.arb.ca.gov/drdb/sju/curhtml/r4565.pdf

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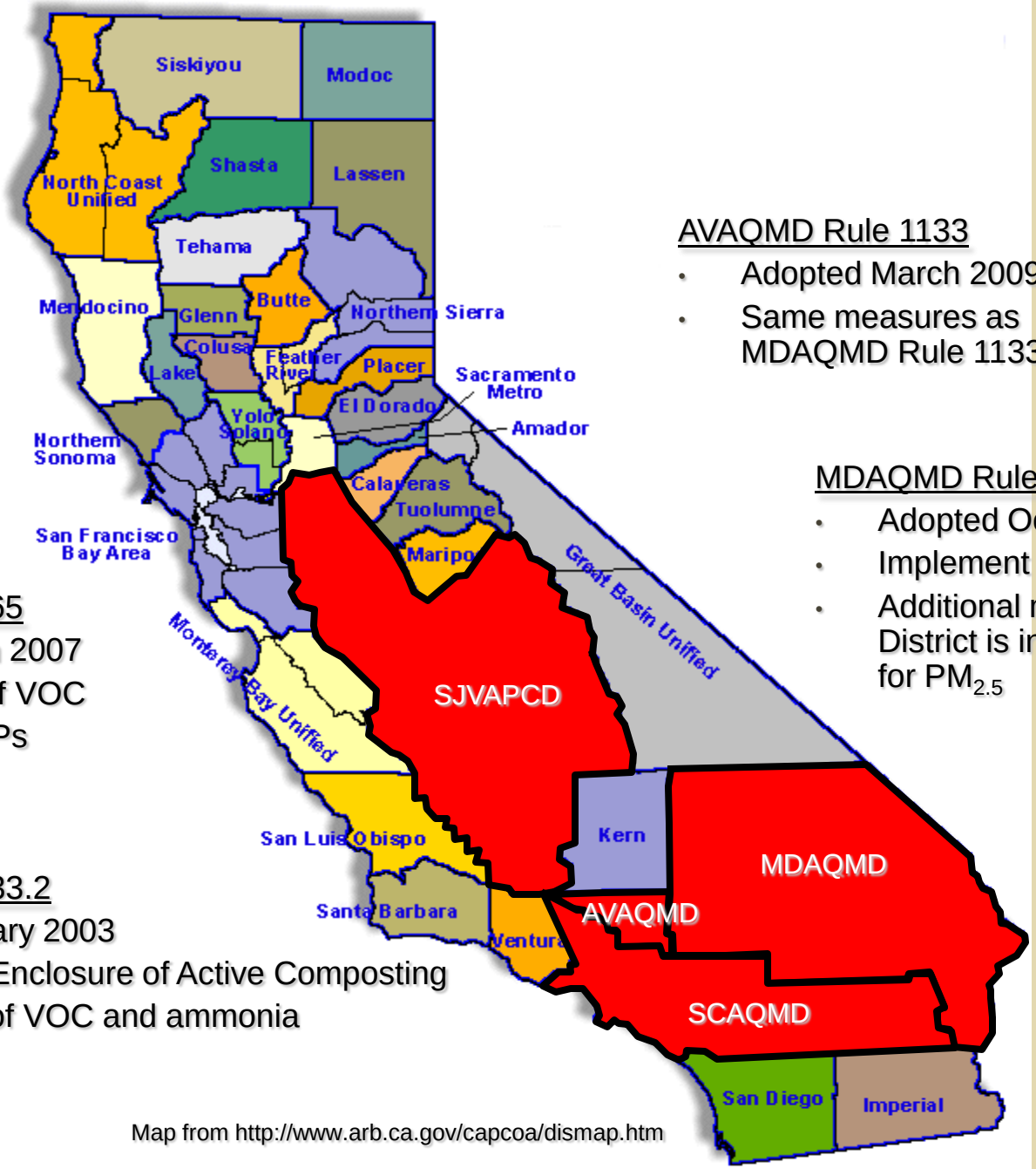
Reason for VOCs being important to biosolids regulations:

Composting Regulations in California



Map from http://www.arb.ca.gov/capcoa/dismap.htm

AVAQMD Rule 1133

- Adopted March 2009
- Same measures as MDAQMD Rule 1133

MDAQMD Rule 1133

- Adopted October 2008
- Implement BMPs
- Additional measures if District is in non-attainment for $PM_{2.5}$

SJVAPCD Rule 4565

- Adopted March 2007
- 80% removal of VOC
- Implement BMPs

SCAQMD Rule 1133.2

- Adopted January 2003
- Requires Full Enclosure of Active Composting
- 80% removal of VOC and ammonia

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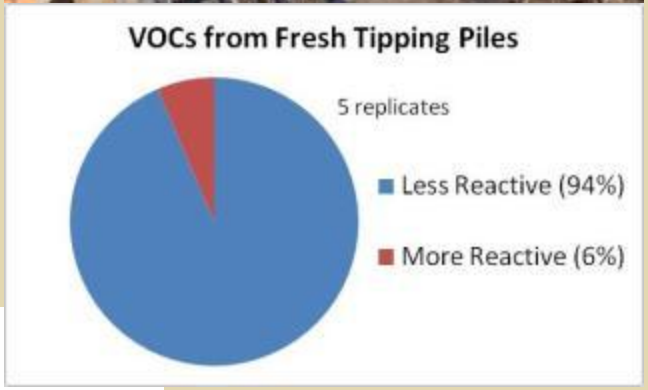
UC Davis VOC Study

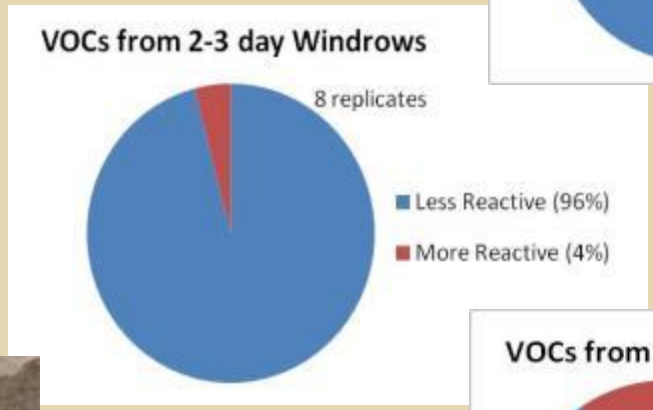
- Study to determine whether the types of Volatile Organic Compounds (VOCs) emitted from typical biosolids operations will react with oxides of nitrogen (NOx) and form ozone.
- Regulators assume that because VOCs are being emitted, ozone will be formed. However, VOCs vary greatly in their reactivity and in their propensity to contribute to ozone formation
- The assumption that a given source contributes to ozone formation should to be evaluated before regulators implement new rules which will raise biosolids composting operating costs.

Autumn 2009 Compost VOC-Ozone studies

Preliminary results, compiled as of January 7th, 2010

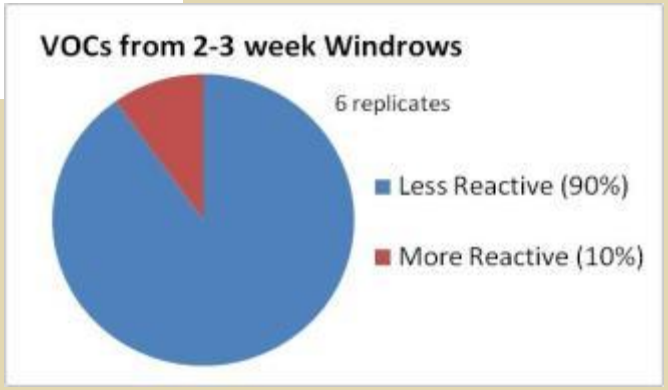
1) Field studies in the Central Valley of California for one week in September and again in October
2) Compost VOCs are among the **least reactive** sources we have ever studied
3) **Only modest amounts of ozone** were able to be formed in our Mobile Ozone Chamber Assay (MOChA)
4) **Dominant VOCs** are low-reactivity (ethanol, isopropanol, acetic acid, acetone, etc…)
5) Small amounts of more reactive VOCs (aldehydes, terpenes, etc…) also found
6) Very **wide variety of VOCs** were found – one of the more complex sources we have ever studied
7) Ozone formation potential is roughly similar for sources: tipping pile, young windrow, aging windrow
8) A young windrow has a **somewhat greater** VOC total, but primarily among low reactivity VOCs
9) The aging windrow retains a **somewhat higher** proportion of more reactive VOCs
10) Characterized the full range of VOCs and matched with traditional 'Total' VOC method 25.3
11) Flux chambers were used at first, but humidity was too high for reliable ozone formation assessment
12) Dilution ("wind") tunnel was used next, and will be used for upcoming mitigation studies





Flux chambers on tipping pile

Dilution tunnel on windrow



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Biosolids Dryers

- Indirect or direct drying.
- Most common is direct drying where hot air is blown into the drum where it directly contacts the biosolids, causing water in the biosolids to evaporate..
- The costs of operating a drying facility can be decreased if it is located at an existing landfill or wastewater treatment plant that has biogas or waste heat (from co-generation facilities) available as an energy source to assist with the drying process.

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Biosolids Dryers

Sanitation district goes green with biosolids project !

The Ventura Regional Sanitation District's brand new biosolids facility, which has the ability to break down and turn wastes into nonpolluting forms, is located at the Toland Landfill. It's hoped this will drastically free up landfill space that would otherwise be slowly encroached by trash buildup.

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How Does a Fluidized Bed Work?

- The biofuels, including biosolids, are mixed in a hot sand bed
- Enough air is blow through the sand to turn it into a fluid, but not enough for combustion (if being used for gasification).
- The biofuels are turned into a gas, with an energy content of about half that of natural gas.
- The gas is burned in a ‘heat recovery boiler’ to make high pressure steam.
- The steam then turns a turbine to create renewable electricity
- There are three “by-products” of this process:
  - Air Emissions
  - Water Emissions
  - Ash from the fluid bed reactor

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Incinerator Emissions

- Emissions
  - Carbon Monoxide
  - Oxides of Nitrogen
  - Oxides of Sulfur
  - Particulate Matter
- Emissions Control
  - High efficiency combustion for NO_X & SO_X control
  - Multi clone for large particulate removal
  - Baghouse for PM control
  - Wet scrubber for vapor condensation
  - Electrostatic precipitator for condensed particles
  - SNCR & SCR for NOX control
  - Scrubber for SOX control
  - Activated Carbon for trace metals removal
  - Stack for dispersion

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CEQA

- New CEQA climate change requirements
  - BAAQMD
  - SCAQMD
  - SJVAPCD

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Thank You

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