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Case Study: Compost Facilities in Air Quality Non- Attainment Districts

2010 Pacific Southwest Organic Residuals Symposium

September 14, 2010

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Challenges Driving Biosolids Management

- Regulations restricting or banning both the land application and use of Class B biosolids as ADC
- Local restrictions (Solano & Kern counties, etc.)
- 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?

- 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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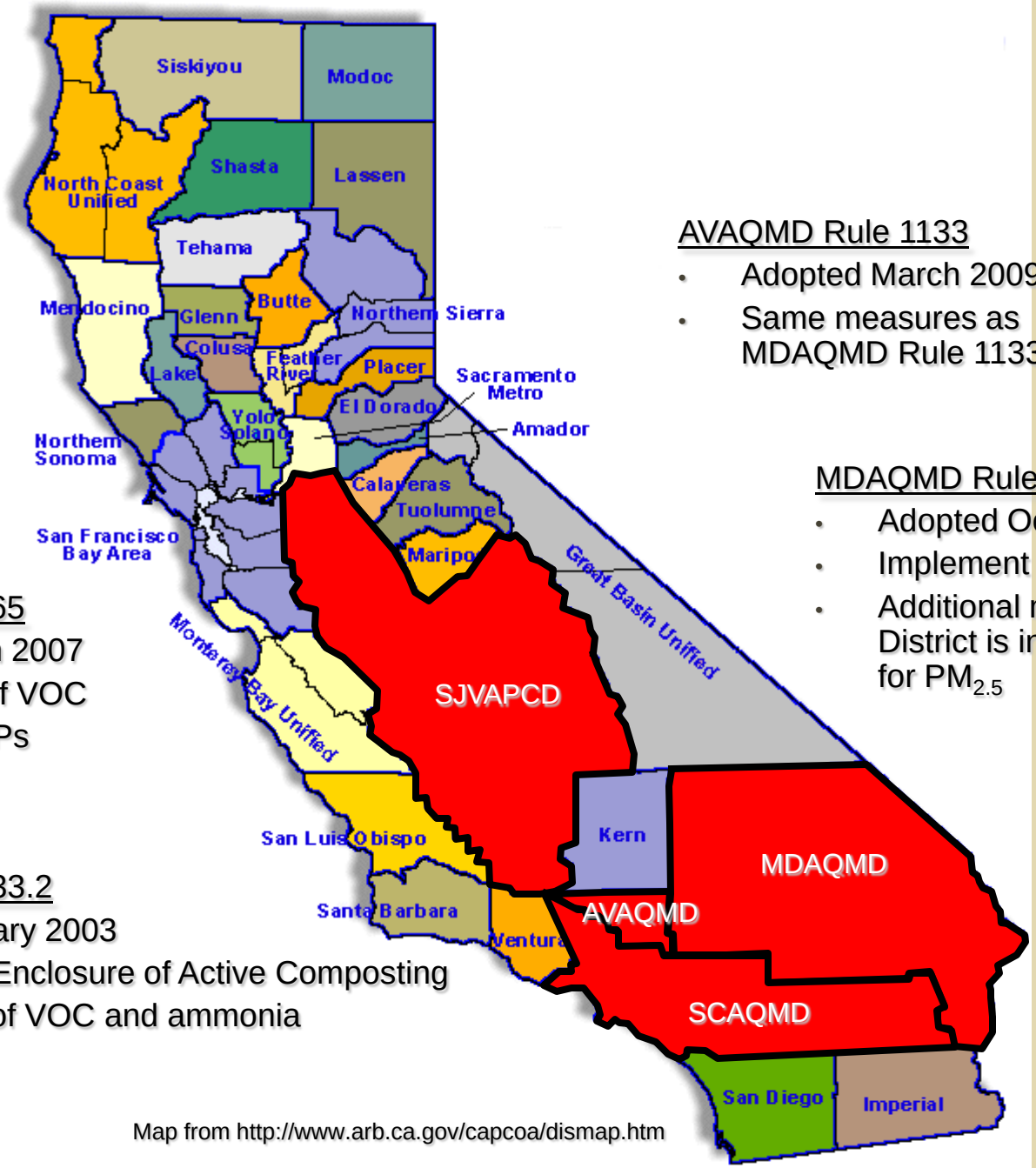
Reason for VOCs being important to biosolids regulations:

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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Case Study
Temescal Canyon – Corona, CA

- Temescal Canyon (Corona, California)
  - 500 wet tons per day
  - Open Windrow

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Case Study
South Kern Composting

- Kern County (near Taft)
  - 500 wet tons per day
  - Aerated Static Pile
  - Enclosed Receiving and Mixing
  - BACT for Air

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Compost AQ Regulations

- Pre-2003
  - Primarily regulated for nuisance odor and dust.
  - No biosolids composting sites had been permitted with specific reduction requirements for VOC or NH3.
  - Biofilters were utilized primarily for odor treatment necessitating an enclosed facility or due to the compost technology chosen (i.e).

- SJVAPCD Compost Regulation
  - None – at time of SKCMF permit application/issuance.
  - BACT for VOC and NH3 at biosolids composting in the SJVAPCD was set via the SKCMF project
  - SJVAPCD Rule 4565 adopted on March 15, 2007 with requirement to reduce VOC emissions by 80%.

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South Kern Compost Manufacturing Facility

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Major Equipment/Processes

Enclosed Biosolids Receiving & Feedstock Mixing Operation

Aerated Static Piles (ASP)

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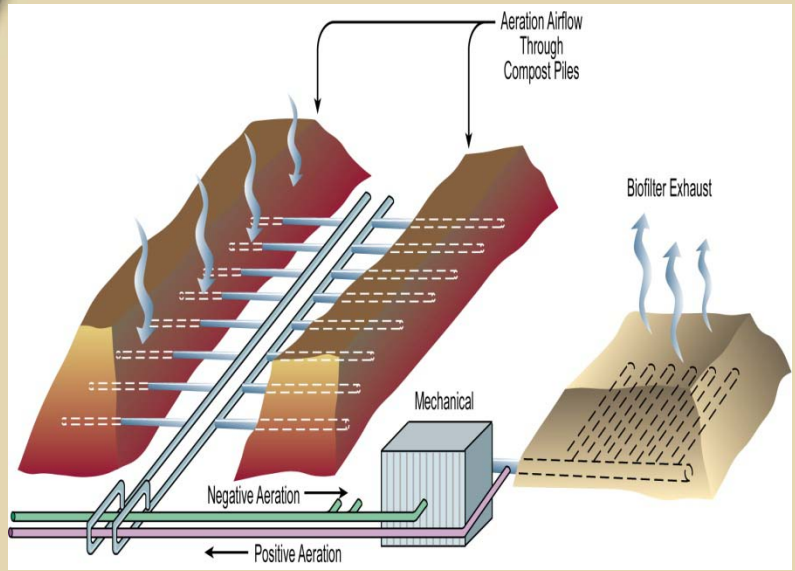
Major Equipment/Processes

Engineered Negative Aerated Static Pile Composting



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Major Equipment/Processes

Process & Contact Stormwater Impoundment

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Major Equipment/Processes

Screening Operation

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Environmental Benefit

- 2009 Source Test Data
  - Total lbs. of VOC's removed by biofilters per year is 539,432 lbs.
    - Percent removal rate = 85% (permit requires 80%)
  - Total lbs. of Ammonia removed by biofilters per year is 162,494 lbs.
    - Percent removal rate = 99.25% (permit requires 80%)

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Impact (500 tons of biosolids/day)

- Average distance to Corona was ~ 90 mi round-trip miles
- Average distance to SKIC is ~300 round-trip miles.
- Does not account for other quantities hauled to AZ due to Corona closure, which would be even further….
- SKIC cost $30M to construct, and $5M for the property/permit
- At least $20M is in the ASP system needs to comply with 4565
- Electrical costs currently are primarily ASP/4565 related
- Management cost per ton Corona ~$28 ($5M/yr)
- Management cost per ton SKIC ~$65 ($12M/yr)
- Annual diesel consumption (RT) @25 tons/truck & 6 MPG
  - Corona 7,300 trips/yr X 15 gal/trip = 109,500 gallons/yr, 657,000 miles/yr
  - SKIC 7,300 trips/yr X 90 gal/trip = 657,000 gallons/yr, 2,200,000 miles/yr

Usage Comparison	Days Billed	Kwh Billed	Kwh per Day
This Year	30	524,123.000000	17,470.766667
Last Year	N/A	N/A	N/A

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Emission Factors for On-Road Heavy-Duty Diesel Trucks

- **HHDT-DSL (pounds/mile)(1,543,000mi/yr)**
- CO **0.01195456** = 18,500 pounds/year
- NOx **0.03822102** = 59,000
- ROG **0.00304157** = 4,700
- PM10 **0.00183062** = 2,800
- PM2.5 **0.0016008** = 2,500
- CO2 **4.21120578** = 6,500,000

www.aqmd.gov/ceqa/handbook/onroad/onroadEFHHDT07_26.xls

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Carbon Dioxide Emissions Coefficients for Electric Power

- Factor - 0.61lbs CO2/Kwh (CA factor)
- SKIC electrical consumption/month – 542,000Kwh
- 330,000 lbs CO2/mo
- ~4,000,000 lbs CO2/yr

http://www.eia.doe.gov/oiaf/1605/pdf/EFactors1998-2000.pdf

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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.
- Current assumption 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 the implementation of new rules which will raise biosolids composting operating costs.

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Thank You

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