



Sustainable Conservation

Environmental Regulation and Energy Generation on CA Dairies

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Collaboration Forum*

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Who Is Sustainable Conservation?

- Environmental Non-Profit
- Founded in 1992
- Collaborative Solutions
- California Dairy Program



California Dairy Industry

- CA Largest Ag State
- CA Largest Dairy State
 - 1.7 Million Cows on 2200 Farms
 - Consolidation, More Cows, Fewer Farms
- 120 Lbs Waste/Cow/Day
- Dairies in Non-Attainment Areas
- Increasing Urban Encroachment



Environmental Impact of Dairies

- Water Quality
- Air Quality
 - VOC, PM, NO_x
- Greenhouse Gas Emissions
 - Dairy Methane is 1% CA GGE
 - What is Effect of Nitrous Oxide?
- Odors and Flies



Dairy Manure is an Energy Resource

- Methane Emissions Wasted
- Anaerobic Digestion Captures Biogas
 - 60% Methane
 - Can Flare
 - Can Combust for Electricity (100-150 MW)
 - Can Upgrade to Biomethane (Eqv to Nat Gas)
- Land Applied Manure Replaces Fossil Fuel Intensive Fertilizer



Dairy Anaerobic Digesters Mitigate Environmental Impacts

- Reduce Greenhouse Gas Emissions
- Reduce VOC Emissions
- Reduce Odors and Flies
- Reduce Pathogens and Weed Seeds in Effluent Water

Environmental Regulation of Dairies

- Air--SB 700 Ended Clean Air Exemption
- Water--New Rules for CAFOs in National Pollution Discharge Elimination System
- Solid Waste--Permitting for Compost
- Greenhouse Gas--No Regulation Yet

Regulation of VOC Emissions

- CARB Emission Factor 12.8 lb/Cow/Yr
- Dairies Significant Source of VOC
- Research Underway
 - New Emission Factor May Be Lower
- Major Sources Require BACT
 - 1,954 Cows
- SJVAPCD Proposes Digester as BACT
- South Coast Proposes AD as Mitigation

Regulation of NOx Emissions

- Dairy Digester Generators Now Regulated
- SJVAPCD Proposing 50 ppm NOx for Dairies
- BACT as per CARB is 50 ppm NOx
 - Based on Large Sewage Plants and Landfills
- CARB SB 1298 Target for 2007 is Lower

NOx Hard to Control on Dairy

- H₂S Corrodes Microturbines and Catalysts
- Good H₂S Removal and Catalysts Expensive and Complex
- Lean Burn Engines Too Large for Most Dairies
- Farmers Avoid Complex Engine Solutions
 - May Not Decide to Put in New Digesters
 - Current Digesters May be Abandoned

Possible Solutions to NOx Problem

- Smaller Lean Burn Engines
- Better Ways To Remove H₂S
- Need Research and Development
- Centralized Digesters
 - Larger Lean Burn Engines
 - Sophisticated H₂S Removal
 - Increased Yield w/Other Waste
 - Logistical, Regulatory Problems
- Biogas to Biomethane

Impact of Environmental Regulation

- VOC Regulation Encourages Digester
- NOx Regulation Discourages Digester
- Greenhouse Gas Regulation Would Encourage Digesters a Lot
- CIWMB Regulations an Issue
 - Composting Manure
 - Utilizing Other Organic Waste Streams

Issues

- No Energy Solution is Perfect
- How to Evaluate Trade-Offs
 - Greenhouse Gas↓↓ VOC↓ Odors↓ NOx↑
- Need to Solve Waste Gas NOx Problem
- How to Develop Collaborative Solutions
 - Industry, Government,
 - Researchers, Environmentalists
- We Cannot Afford to Waste Methane in Dairy Biogas, Digester Gas, Landfill Gas

