San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

Control Technologies for Use of Digester Gas

For Climate Action Reserve Webinar – A Path Forward for Dairy Digesters in California

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HEALTHY AIR LIVING™

San Joaquin Valley

- Hot, sunny summers
  - VOC, NOx
  - Ozone Problem
- Cool, foggy winters
  - Particulate problem

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Federal & State Air Quality Regulations

- Federal Clean Air Act Requires District to achieve clean air, or
  - Huge fees on local industry
  - Loss of Federal highway funds
  - Feds take over local air program
- Federal and State regulations require Best Available Control Technology (BACT) for new or modified equipment to minimize emissions
- 2007 Extreme Ozone Plan
  - Requires every feasible VOC and NOx reduction
  - Achieves clean air in 2023 only with reliance on "black box" of unknown technology

Advantages of Use of Biogas

- Reductions in greenhouse gas emissions needed for AB32
- Increased renewable energy to meet California's goals of attaining 33% of its energy from renewable sources by 2020
- Potential for VOC and odor reductions from waste storage.
- CEQA

Challenges Related to the Use of Biogas

- Increased NOx emissions compared to combustion of natural gas
- Contaminants hinder the use of emission controls
  - Water Vapor
  - H2S can be very high depending on digester substrate

Internal Combustion Engines

- **As low as 35-50 ppm NOx (best lean-burn engines, without external pollution controls)**
- **Engine controls**
  - Three-way catalysts on rich-burn engines
  - Selective Catalytic Reduction (SCR) lean-burn engines
  - NOxTech for large lean burn engines
  - Hydrogen Injection

Gallo Cattle Company Digester Gas-Fired Engine with 3-Way Catalyst

Fiscalini Farms Dairy Digester Gas-Fired Engine with SCR

Other Low-Emission Combustion Technologies

- **Microturbines** – very low NOx, but more demonstrations needed
- **Gas Turbines** (For very large projects > 2.5 MW)
- **Boilers/Steam Generators**
- **External Combustion Engines** (Currently Being Developed)

Four 30 kW Capstone Microturbines at Top Deck Holsteins Dairy in IA

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Other Air Friendly Technologies

- **Fuel Cells**
  - Near-zero emissions, super efficient
  - Proven technology, but costly
  - Large incentives available for installation (but are incentives enough? – no dairy proposals, yet)
- **Gas Pipeline Injection**
  - Avoids NOx emissions associated with combustion
  - Limited availability (must be close to pipeline)
  - One installation in operation in the Valley
- **Compressed Methane as Vehicle Fuel**
  - No need to be near a pipeline
  - Replaces combustion of diesel fuel

Hilarides Dairy Bio-methane Powered Milk Trucks

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Current Farm Biogas Demonstration Projects in the San Joaquin Valley

- **Rich Burn Engine with three-way Catalyst**
- **Lean Burn Engine with SCR**
- **Permits Issued for Greenguard (Virtual lean burn) engines with NSCR**
- **Permit Recently Issued for Ultra Lean Engine with Hydrogen Injection**

- **The District looks forward to facilitating more innovative proposals for project that will increase renewable energy while meeting the Valley's Air Quality needs**

How We are Moving Forward

- The San Joaquin Valley Air District encourages win-win solutions that will increase renewable energy production in the Valley while meeting the Valley's Air Quality needs
  - Encourages no-NOx and low-NOx innovation:
    - Advanced engine controls
    - Gas pipeline injection, fuel cells, compressed methane
    - Examine Feasibility of Central Power Plants for Multiple Facilities grouped together
  - Allow flexible permits – use controls but BACT limit can be increased if it cannot be achieved
  - Working together with other agencies to find ways to fund or partially fund promising low-NOx proposals

Air District Contacts

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Grants, funding issues:

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