Methane Reduction Strategies on California Dairies

Prins Dairy, Stanislaus County

Description of Operation:

Prins Dairy, operating since 1971, is a 600-cow operation using a combination of grazing and free stall housing. They have 185 acres of grazed pasture and another 185 acres planted in corn and wheat for silage.

Manure Management Approach:

The dairy has been using its current manure management system since 1999, refining it and improving it continually. Manure is flushed from free stall barns using recycled water through a fine screen separator. The solids are composted and the liquid is moved into ponds. The ponds are inverted 24 hours a day by vortex circulation with Circul8 Systems™ that exposes naturally occurring photosynthetic purple sulfur bacteria to sunlight so they can digest the organic material in a three-pond system. The ponds are more diluted compared to typical stagnant lagoons to ensure the best translucent habitat possible for the beneficial bacteria. A USDA study of microorganisms in the Prins lagoon water found no Archaea (the only microorganisms that produce methane).

Benefits to Producer:

- Fertilizer to improve soil health is produced in two forms: compost from the separated solids, and plant-available fertigation water that is biologically alive and nutrient-rich (anaerobic systems lose most of their nitrogen as ammonia and sulfur as hydrogen sulfide)
- Improved crop yields without need for commercial fertilizer
- Lower levels of odor and VOC, H2S, and NH3 emissions from ponds
- Less rusting within facility due to significant reduction of corrosive gas
- Better hoof health and cow health because disease-causing pathogens do not survive in a properly circulated ponds; eliminates need for copper sulfate foot baths which is toxic to lagoons, soil, plants and animals
- Eliminates stagnant water in lagoons that can create mosquito habitat
- Flush alleys are not slick, and are safer for cows and workers

Challenges, Barriers, and Desired Improvements:

- This system works best under a high rate of dilution which requires more fresh water and greater pond capacity than conventional stagnant lagoons
- Requires land for compost production and nearby cropland to apply irrigated fertigation liquids
- Some electrical energy will be required, though it is very low

Cost Estimate for System = $625 per cow

For an 800-cow dairy, the estimated cost of installing the circulators is $200,000. The lagoon size would likely need to be increased at a cost of $250,000, and the current lagoon system clean-out would cost $50,000. Kevin, as an experienced user, estimates his costs are 1/10 to 1/4 that of a digester with easier maintenance.

Aeration of manure lagoons with Circul8 Systems

Ponds populated with purple sulfur bacteria

"This is really a simple system that is all about working with nature and not against it. Nature will win!"

— Kevin Prins

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