

Engineering Data Sheet

0048

Project: Ag (Agricultural) Preserve Project, San Bernardino County, California

Cow Facts:

1. There are 1,100,000 cows in California
2. There are 300,000 to 320,000 cows in the Ag Preserve
3. The Ag Preserve covers 25 square miles
4. The average cow consumes 28 lbs. grain per day
5. The average cow consumes 25-30 lbs. hay per day
6. The average cow consumes 55-60 gallons water per day
7. The Ag Preserve currently has some 200 dairies
8. The average dairy has a 90 kW standby generator
9. The average dairy's utility bill is \$4,000-\$5,000 per month (say \$150 per day)
10. The average milking parlor has 20-28 stalls which produce an average of 3,000 to 3,500 gallons per day (GPD), 7 days a week
11. The Ag Preserve produces approximately 14,200,000 GPD wastewater or 71,000 GPD per average farm
12. The cow yards (corrals) are typically scraped daily. Manure piles are generally cleared from the corrals twice per year at \$40,000-\$50,000 or \$80,000 to \$100,000 per year (say \$250 per day and \$25 per ton)
13. Total manure solids (dry weight basis) averages 22,400 lbs. per day
14. Average dairy size is 1,600 cows (includes non-milkers)
15. Average farm produces 10.5 lbs. volatile solids per cow which = 16,800 lbs. per day per farm
16. Average farm can generate methane with OAT™ process at 275,000 cubic feet per day (CFD)
17. Enough gas to power a 750 kW generator
18. The generator will produce about 18,000 kWh per day of which 15% is used to operate the OAT™ plant
19. Another 1,875 kWh per day can be used to operate the dairy
20. The excess (18,000 less 2,700 to run OAT™ less another 1,875 to run dairy) is 13,400 kWh which at 0.04 = \$536 per day
21. Sludge produced with OAT™ process is 0.01 lbs per lb COD or 178 lbs per day on dry weight basis. At a moisture content of 25%, this translates into 712 lbs per day of Class A biosolids or about 3% of current average farm manure production and its associated disposal costs

Results: from a minus \$400 per day (electricity plus manure disposal) to a plus \$536 less \$10 for sludge disposal for an astounding swing of \$926 per day! Not included is the expense of plant operation which is discussed below

Cost of equipment

On individual farm basis:

1. OAT™ plant with nutrient removal including 750 kW generator \$875,000
2. OAT™ plant with nutrient removal excluding generator \$650,000. Dairy farm can use some of the methane generated to run their own 90 kW generator which is sufficient to satisfy their power needs with excess methane to be flare wasted or sold to a natural gas distributor. Some additional equipment would be necessary to bring the gas up to pipeline quality.
3. OAT™ plant without nutrient removal and without generator \$330,000

On a single plant basis to service the entire Ag Preserve's 200 dairies:

1. OAT™ plant with nutrient removal and 130 MW generator about \$60,000,000 or \$300,000 per farm. This is lower than the total swing translating into less than a one year return on investment
2. OAT™ plant without nutrient removal but with 130 MW generator about \$50,000,000
3. OAT™ plant without nutrient removal and without generator about \$25,000,000. The gas produced, some 47 million CFD, can likely be sold to a natural gas distributor. Some additional equipment would be required to bring the gas up to pipeline quality (mostly drying). The value of the gas would be about \$2.00 per 1000 CF or \$94,000 per day.

The economies of scale strongly favor a large single plant to service the entire Ag Preserve. Operating costs would yet have to be developed to operate the plant as well as truck the wastes if this option is of interest. In either event the starting point is the same in both cases, namely a pilot unit to demonstrate the technology. The Milk Producers Council might be a candidate to own this facility. Of course there are other entities such as the Associated Milk Producers Association, Green Power Marketers, or even straight investors who would profit from the collection of the manure (estimate about \$10 per ton tipping fee) and the resulting sale of excess energy.

