Using Landfill Gas as the Alternative Fuel for a 200-WTPD Thermal Dryer

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Manatee County is located on the west coast of Florida and, like many other areas in the state, is experiencing rapid growth that at times taxes the capacity of its wastewater utility infrastructure. The county owns and operates three water reclamation facilities (WRFs): the North, the Southeast, and the Southwest. All have non-discharge permits.

All the wastewater treated by the county's WRFs is land applied on residential sites, farmlands, or golf courses. The county recently completed its Manatee Agricultural Reuse System (MARS), which won a national award in 2006 for large reuse systems greater than 15 million gallons per day (MGD).

Table 1 summarizes the current and ultimate capacities of the county's three WRFs. The effluent of all three facilities meets state requirements for reclaimed water (high level disinfection). Residuals from the three facilities meet the requirements for Class B biosolids (503 regulations) and are land applied on approved sites in Charlotte and Polk counties.

Table 2 summarizes the anticipated biosolids from the county's three WRFs at their current design capacity. The North and the Southeast WRFs use aerobic digestion to stabilize residuals generated by these two facilities. The Southwest WRF uses anaerobic digestion to stabilize the biosolids generated by that facility. All three facilities have consistently met the residuals requirements found in their respective operating permits.

Methods

Like so many other locations in the United States, Manatee County is finding fewer sites that will accept Class B biosolids. There are numerous reasons, including development and an increase in public opposition.

County officials decided to be proactive by implementing thermal drying of stabilized biosolids to meet Class AA requirements found in the 503 biosolids regulations. They selected direct drying as the drying technology of choice and further decided to locate the dryer on the site of the Southeast WRF so an alternative fuel could be used to power the dryer.

The county selected this site because of its location next to the Lena Road Landfill. The flare for the landfill's methane gas collection system is close to the area chosen for the dryer. Since the landfill has an abundance of methane gas, this landfill gas was selected as the primary fuel and natural gas was selected as the backup fuel for the dryer.

The county completed an extensive investigation before selecting direct dryer technology to implement thermal drying of biosolids generated by its three water reclamation facilities. Reasons for the selection include:

- The county wanted long-term service from the dryer provider and insisted that vendor-supplied maintenance services be clarified in the proposals received from prospective vendors. The county required that prospective vendors provide the backup needed to ensure long-term support for the equipment, and that the information be provided as part of the vendors' respective proposals.
- The county wanted prospective vendors to have experience in Florida with the size and type of dryers needed by the county. This requirement was later removed, since only one vendor could then meet the requirements for the request for proposals.
- The county was also very concerned with safety, and this was a requirement that had to be met by any vendor. The county required that prospective vendors provide in their proposals the operating history and details concerning any accidents or failures related to equipment.
- The county required that the vendor or his contractor must have a valid contractor's license in the state of Florida and that all subcontractors had to be listed in the proposals submitted by vendors interested in the project. The county also required the vendor to submit resumes for all staff members who would be provided for the project.

Following a 90-day bid period, the county received only one valid bid for the project. The bid was received from Andritz-Ruthner of Dallas, Texas. Following negotiations, a final price was accepted for just over $14 million.

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Table 1: Current and Ultimate Capacities

WRF	Current Capacity, MGD	Ultimate Capacity, MGD
North	7.5	24
Southeast	11	24
Southwest	22	28
Total	**40.5**	**76**

Table 2: Anticipated Biosolids

WRF	Current Capacity, TPD[1]	Ultimate Capacity, TPD
North	8.0	25
Southeast	11.5	25
Southwest	23.0	29
Total	**42.5 (dry)/198 (wet)**	**79 (dry)//367 (wet)**

Results & Discussion

Table 3 lists the fuel requirements for the dryer purchased by the county (data taken from the vendor's proposal).

Analysis of the landfill gas collected at the flare provided the following information:

- 41.5 Percent Methane Gas
- 34.3 Percent Carbon Dioxide
- 2.5 Percent Oxygen
- 21.5 Percent Balanced Gases (Mainly Nitrogen)

The results of the analysis showed that landfill gas had approximately half the heating value of natural gas, so it will take approximately two and a half times as much landfill gas to provide the same heating value as natural gas. Table 4 shows the cost for the county to use natural gas.

The county will save up to $1.7 million per year by using landfill gas as the primary fuel for the dryer. The main problem concerning the landfill gas is high carbon dioxide and nitrogen emissions from the dryer that would be in violation of the Clean Air Act. To overcome this problem, the county elected to install a thermal oxidizer to treat the emissions. The thermal oxidizer also uses landfill gas as its primary fuel, so the total cost saved by the county for using landfill gas will be over $2 million per year.

Conclusions

The project is currently under construction and should be on line before the middle of 2008. The biosolids generated by the county will meet the state's Class AA biosolids criteria following the drying process. The county intends to use the pellets from the dryer as a soil amendment for the daily cover at the landfill, and also plans to sell the pellets to local farms and residents as a fertilizer. The savings over natural gas will also provide the county a payback for the capital cost of the dryer over a seven- to eight-year period.

Table 3: Fuel Requirements

Dryer Fuel	Natural Gas	Landfill Gas
High Heating Value, BTU/SCF	1,038	410
Fuel Volume, CFH	19,269	48,700
Dryer, Therms/hr	200	202
Total Therms/hr (with 10% Contingency)	220	222

Table 4: Capacity Analysis Based on 200 TPD of Biosolids

Natural Gas Requirement, CFH	19,269
Daily Natural Gas Requirement, CFD	462,456
Daily Natural Gas Requirement, Therms	4,625
Annual Natural Gas Requirement, Therms	1,687,964
Cost for Natural Gas, Cents/Therms	95
Delivery Charges, Cents/Therm	12.5
Total Cost, $/Therm	1.075

Table 5: Annual Cost Based on Dryer Operation

Item	3.5 Days/WK	5 Days/Wk	6.5 Days/Wk
Natural Gas Used, Therms/Wk.	1,687.50	23,122.80	30,059.64
Gas Cost, $/WK.	$17,402	$24,857	$32,314
Gas Cost, $/Yr.	$904,881	$1,292,565	$1,680,334

The roof to the new dryer facility under construction

PHOTOS COURTESY OF MANATEE COUNTY

This south elevation, above left, shows the dryer building under construction. The building, nearing completion in the photo, left, also houses offices.