

Alternate Use for Food Waste Anaerobic Co-digestion

City of Fort Worth
Village Creek Water Reclamation Facility
4500 Wilma Lane, Arlington, Texas

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Background

- Service to over 1,000,000 customers in 23 communities
- Rated Capacity - 166 MGD
- Average daily flow - 110 MGD
- Average Biosolids produced – 85 Dry Tons/day



Animal Waste Management

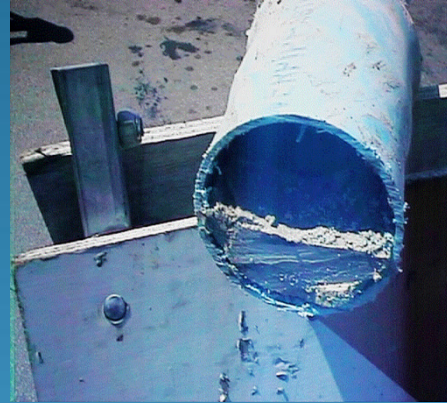


Food Waste Impact on Environment



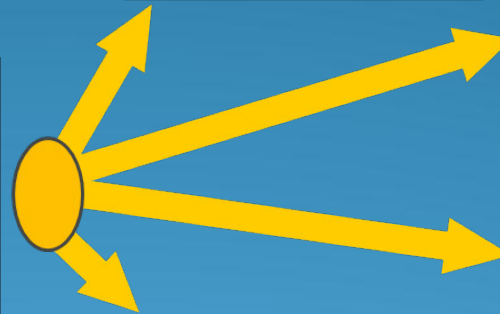
Sanitary sewer
overflow due to
food waste
blockage

Food Waste Impact on Plant and Process



- Collection System blockages
- Scum disposal cost
- Increased energy demand for treatment

Turning a liability into an asset



Digestion

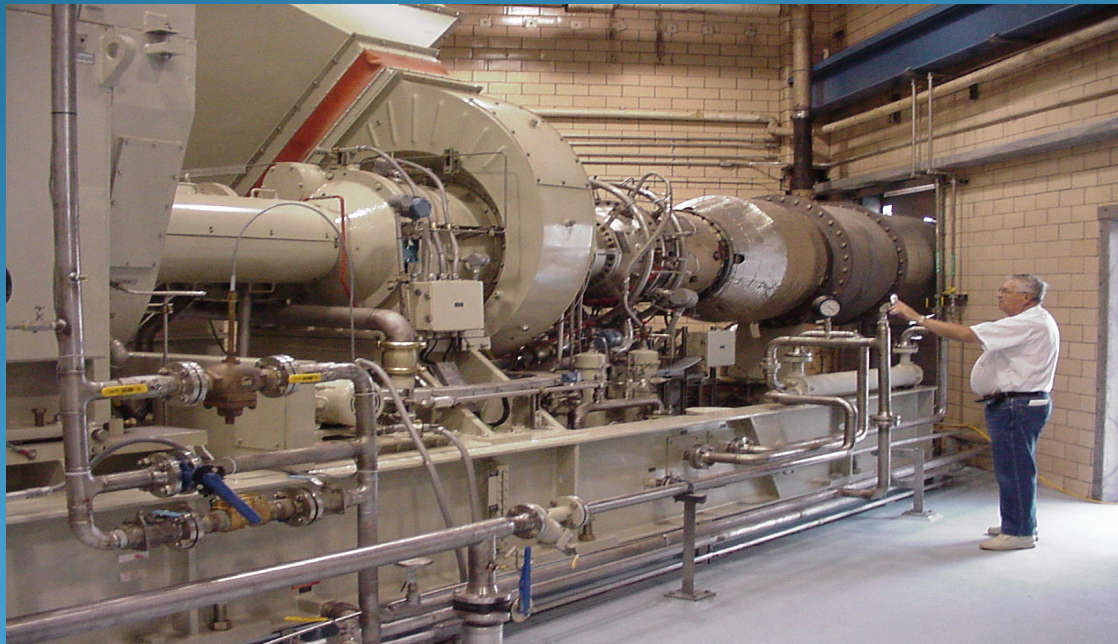
- ❖ Settled primary solids and “waste activated sludge” are digested in anaerobic digesters (bio reactors) for “volume reduction” and stabilization (Vector Attraction Reduction and Pathogen Reduction)
- ❖ Anaerobic bacteria consume/break down solids in an environment that is without oxygen

Biogas

- ❖ Biogas is product of anaerobic digestion
- ❖ Biogas used as fuel for combustion turbines
- ❖ Insufficient biogas from influent and internal process waste streams for fuel to run one combustion turbine at full output
- ❖ Purchase additional gas from nearby landfill
- ❖ Insufficient biogas to run turbine and HRSG
- ❖ Needed to increase biogas availability

Cogeneration Background

2 – 5.2 MW Solar Taurus 60
Turbine Generators



50% on site
electrical generation
Save \$3 million per
year

Food Waste “Co-digestion” to improve Biogas production

Key component of an overall Energy Savings Performance Contract

Goal: To Improve Energy Efficiency, reduce cost
Enhance Energy production and
Achieve Energy Independence

Facility Improvement Measures

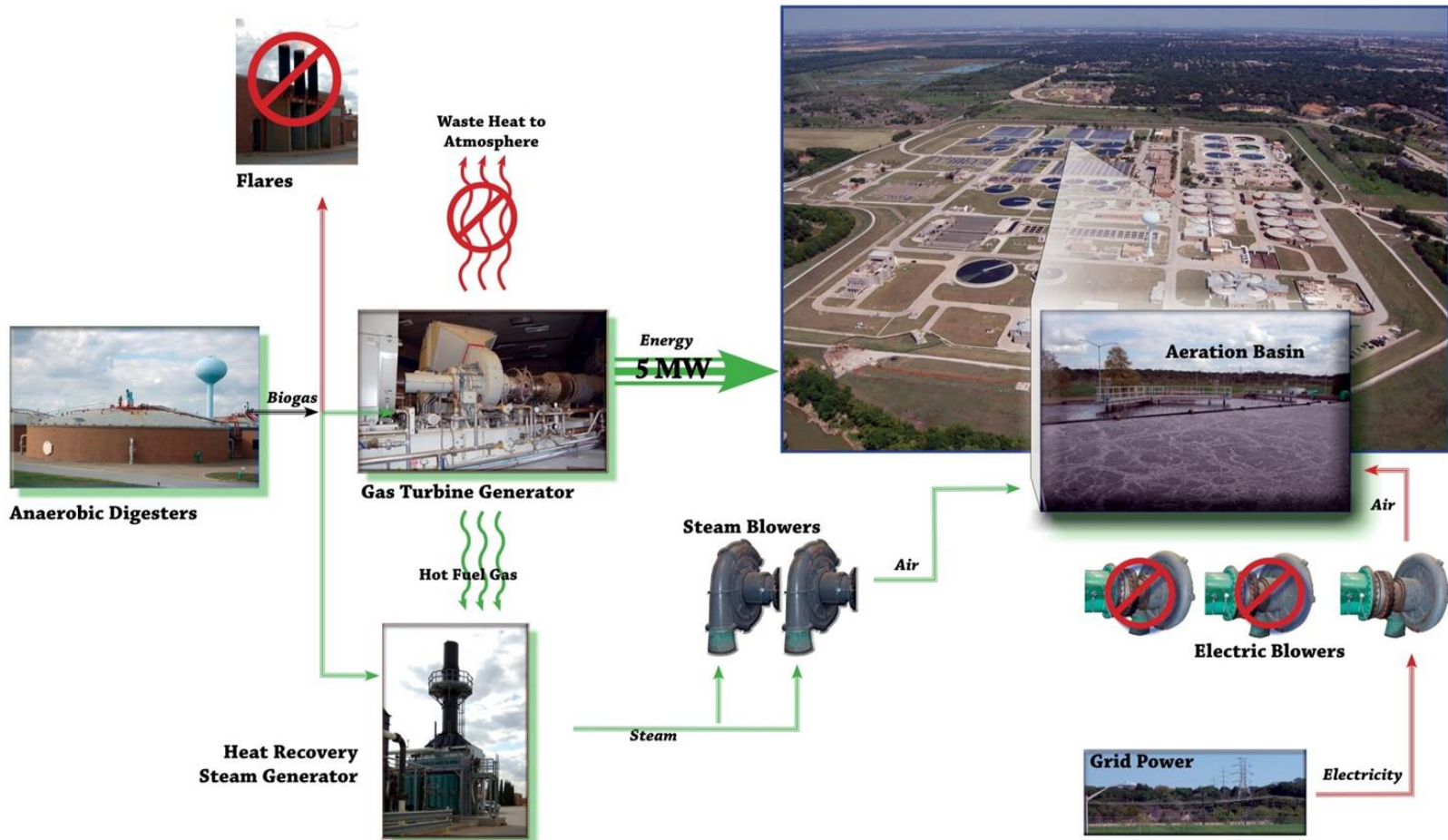
1. Diffuser Replacement
2. Heat Recovery Steam Generation
3. Digester Mixing & Co-digestion Facility
4. SCADA replacement
5. Anoxic zones
6. HVAC, Power Factor Correction, pump efficiency

Increasing Biogas Production

- ❖ Need more “food” for the anaerobic bacteria
- ❖ Need the right “diet” for maximum biogas production
- ❖ Minimize potential problems (foaming, toxicity)
- ❖ Minimal impact on biosolids production
- ❖ Evaluated local “market” of available “high strength wastes” that meets needs

VCWRF Improvements

VILLAGE CREEK WATER RECLAMATION FACILITY HEAT RECOVERY STEAM GENERATOR SYSTEM



Heat Recovery Steam Generator



Steam Turbines



Co-Digestion Facility





Process

Surveyed perceived “market” for available “high strength waste Streams”

Solicited interest from interested parties

Received/evaluated potential waste streams

Developed supply agreements

Scheduled deliveries for consistent digester feeding

- Offloading takes approximately 30 minutes (don't want drivers to have to wait too long)

- Limited storage (need to ensure tank capacity to affect offload volume)

- Sufficient waste to get through the night/weekend

Received waste

- Clear through security

- Operator/supplier affect offload/complete manifests

- Sample/validate

- Set feed-rate to match expected deliveries (for consistent, effective gas production – no gas storage)

Monitor (feed rates, waste characteristics, temperature, digester performance, etc.)

Waste Evaluation

Profile developed to assess waste for:

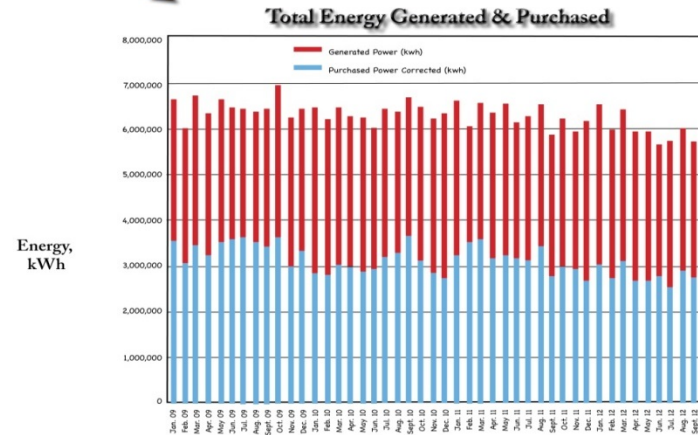
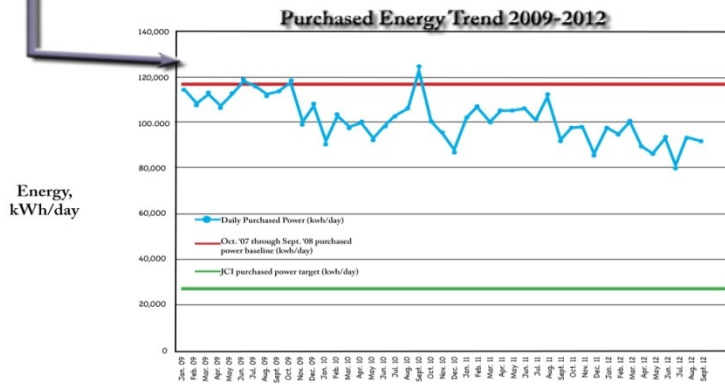
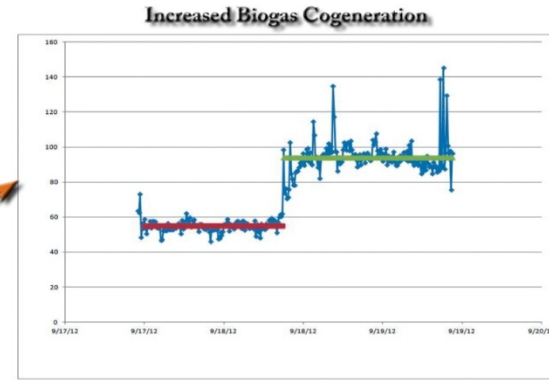
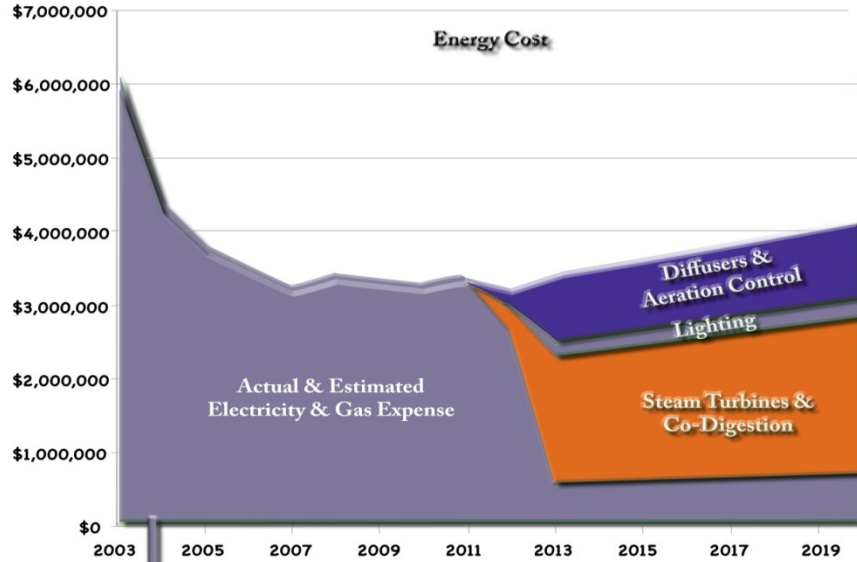
- ❖ Strength (gas production potential - COD)
- ❖ Loading on the digesters
- ❖ Pollutants that threaten digester performance or sludge quality (i.e. heavy metals, sanitizers, sulfates)
- ❖ Compatibility with other waste streams and process
- ❖ Solids content: pumpable (at varying temperatures),
- ❖ Not diluting digester; limited storage
- ❖ Non-volatile fraction (cost to treat/dispose of residuals)

Current Customers/waste types

- ❖ Internal plant “scum” (> 1 million gallons per year)
- ❖ Two grease trap waste processors (10 million)
- ❖ Two “used grease” processors (>1 million gallons)
- ❖ One biodiesel manufacturer (1/2 million gallons)
- ❖ Soft drink manufacturer (>1 million gallons)

- ❖ Other potential customers – several large/local food manufacturers/packagers; grocery stores
- ❖ Waiting list for program participation

VILLAGE CREEK WATER RECLAMATION FACILITY TOWARD ENERGY NEUTRALITY



- Total Project Cost \$36,756,399
- Annual O&M and Electrical Savings \$3,184,757
 - 12 year payback
 - No Rate Impact

Future plans

- ❖ Feasibility Study underway
- ❖ Short term – 2 more digesters incorporated into codigestion program
- ❖ Expand codigestion (receive additional feedstock)
- ❖ Develop/procure fuel for second combustion turbine
- ❖ Export excess power

Lessons learned

- ❖ Odor control
- ❖ Pipe material (long-runs of pipe, higher than expected waste temperature)
- ❖ Storage (tank size/installation considerations)
- ❖ Cam-lock connections inside secondary containment structure and braced to support weight of hoses
- ❖ Screening
- ❖ Spill containment/clean-up provisions

Questions?

