Codigestion Basics

Digester Day

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Questions to Answer

- Codigestion – what is it?
- What are the risks and benefits? (process upsets, tipping fees, increased gas production, better financials)
- If we put food waste into a biosolids or manure digester, don’t we contaminate the food waste?
- If we put food waste or some other outside waste into a biosolids digester, don’t we increase the nutrient load to the wastewater plant?
Why Codigestion?

- Ability to shrink or eliminate fossil fuel usage at wastewater treatment facilities
- Minimization of carbon footprint
- Find innovative solutions to traditional problems
- Maximize beneficial use of “waste” materials
What is Bioenergy?

Biomass

- Sunlight
- Carbon Dioxide

Renewable Energy

- Biogas
- Biofuel
- Biodiesel
- Bioethanol

Biomass 

Renewable Energy
Energy Profile at a typical California WWTP

- Methane gas recovery in cogeneration engines
- Solar power
- Grid power
Co-Digestion = Energy Self-Sufficiency?

Current: 30% Power Demand Met by Renewable Energy
Future: 80% to 100% Self Sufficient

Energy Recovered from Wastewater Solids
Energy Recovered from Food Waste
Other Bioenergy Sources
Solar

Grid Power
Solar
Codigestion Source Materials for a Typical Municipality

- Biosolids
- Yellow Grease = Cooking Oil
- Brown Grease = Waste Trap Grease
- Food Waste = Green Bin
- Other Industrial Organics (e.g. off-spec food products)
The Problem with FOG – Fats, Oil, and Grease

- U.S. EPA, Clean Water Act
- Requires elimination of dry weather stoppages (i.e., FOG blockages)
- CMOM – grease control program
What is Brown Grease?

- Fats, Oils, and Grease (FOG) that have come into contact with graywater
- High free fatty acid (FFA) Content: 50-100%
- Found in restaurant grease traps and interceptors
FOG Control Ordinances

• Most require installation of some kind of grease trap with basic BMPs

• More cutting edge:
  • Restaurants must install/upgrade to Automatic Grease Recovery Devices (AGRDs) within 3 years
  • AGRDs ensure daily recovery, dewatered grease, easy collection
  • AGRDs must be serviced & inspected every 90 days
  • All recovered FOG must be beneficially reused
FOG Conversion Facility
Food Waste

• A new area for investigation
• Potential to generate more biogas (EBMUD)
• Requires more planning and study
Drivers for Creation of a Food Waste Program

- Zero waste goals
- Landfill organics bans
- Energy recovery from digestion process
- Greenhouse gas reductions
- Composting is proven/logical approach, but air emissions (VOCs) can be problematic
Food Waste Is A Key Component to Meeting Landfill Diversion Goals
Food Waste
Digester
Digested Residual
Compost
EBMUD Pretreatment Process
Input/material to be treated:
Source – separated household waste
Operating on demonstration scale since 2006
Processes 25,000 metric tons/year
Operational issues with organic waste only digesters (ammonia inhibition)
Plant at Lillehammer

- Source – separated household waste and food waste from industrial sector.
- Capacity: 14,000 t/a
- For every 1000 kg input, there is approx. 380 kg reject and 150 kg of digestate. The plant makes about 300 kWh of electricity per 1000 kg of post-reject waste.
- Biogas converted to electrical power; THP steam and digester heat.
- In operation since 2001
Benefits of Codigestion to a Municipality

• All types of organic waste can be treated in one plant
• Efficient recovery of biogas, a renewable energy source
• Closed system with a minimum of smell/odor
• Energy can be recovered as electrical power, combined heat & power, compressed biogas (CBG) upgraded to vehicle fuel
• Revenue from tip fees (SF Bay agencies $0.03-$0.15/gallon)
Codigestion Impacts on a WWTP

- Challenges:
  - Preprocessing: off-site? Pumpable? Truckable?
  - Control of incoming wastes/need to establish permit program
  - Pretreatment of wastes to remove debris and protect equipment
  - Ensuring sufficient digester capacity
  - Potential for process upsets – need to provide uniform feed
  - Effect on biosolids and/or organics end use
  - Unknown effect on nutrient content in sidestream
  - Odor potential at receiving area and during maintenance
  - Public outreach
Implementation Scale

- Industrial/liquid food waste
- FOG
- Source Separated Food Waste
Questions?

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