

Anaerobic Co-Digestion of FOG: Pilot Demonstration at BCUA

NEW JERSEY WATER ENVIRONMENT ASSOCIATION
SPRING CONFERENCE
ATLANTIC CITY

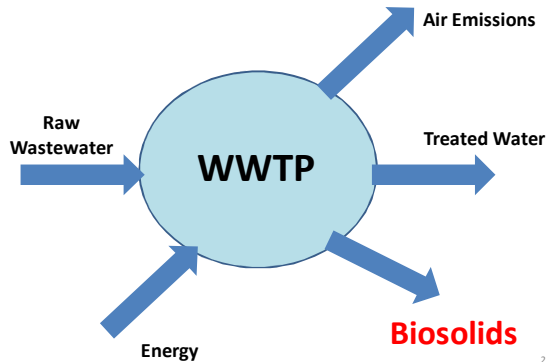
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Presented by:
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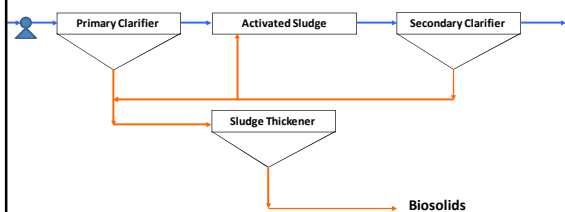
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Problem Statement



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Liquid & Solid Streams in WWTP

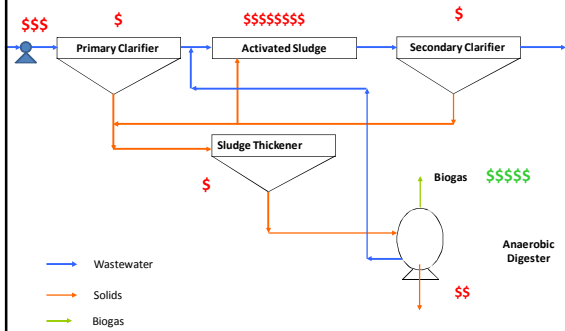


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Biosolids Management

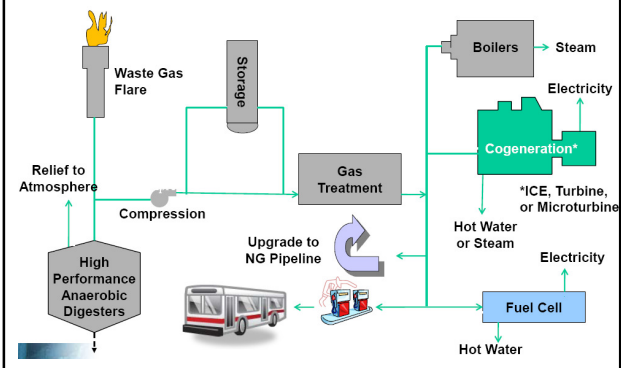
- Ocean Dumping (banned)
- Landfilling (cost)
- Incineration (cost, emissions, NIMBY)
- Aerobic Stabilization
- Anaerobic Digestion
- Innovative Technologies
- Etc.

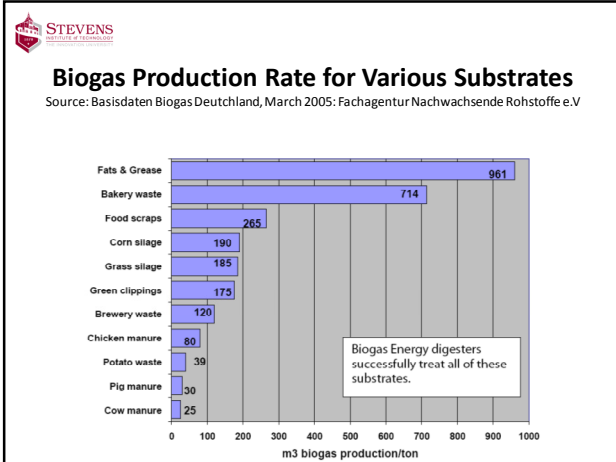
WHERE IS THE ENERGY SPENT in WWTPs?



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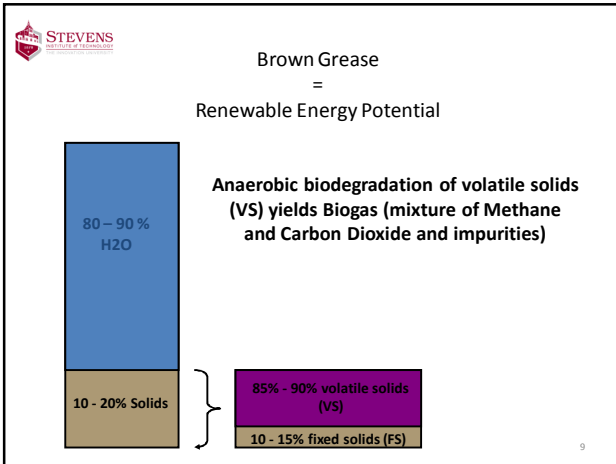
Beneficial End Use of Biogas





What is Brown Grease?

- Fats, Oils, and Grease (FOG) that have come into contact with graywater
- Found in restaurant grease traps and interceptors
- High free fatty acid (FFA) Content: 50-100%
- Not “economically” suitable as feed stock for biodiesel



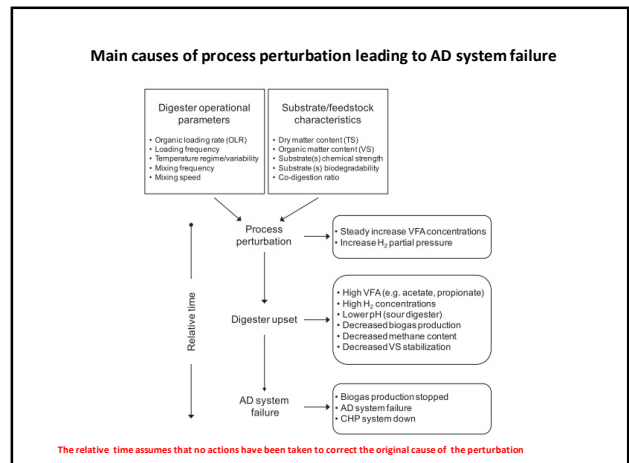
How much Brown Grease is there?

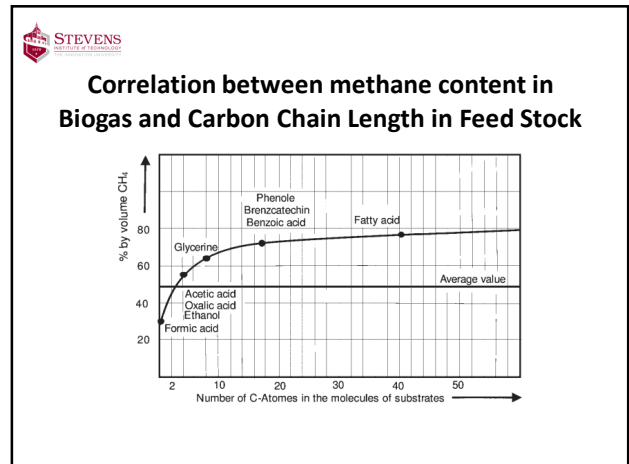
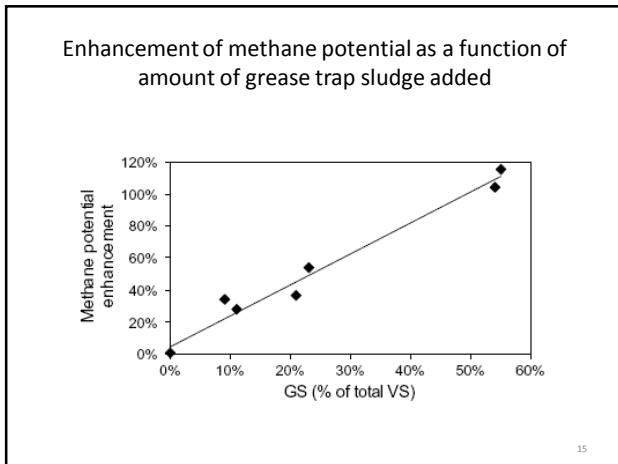
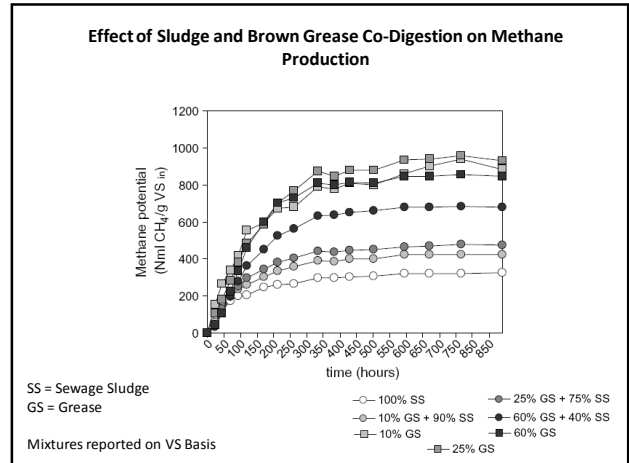
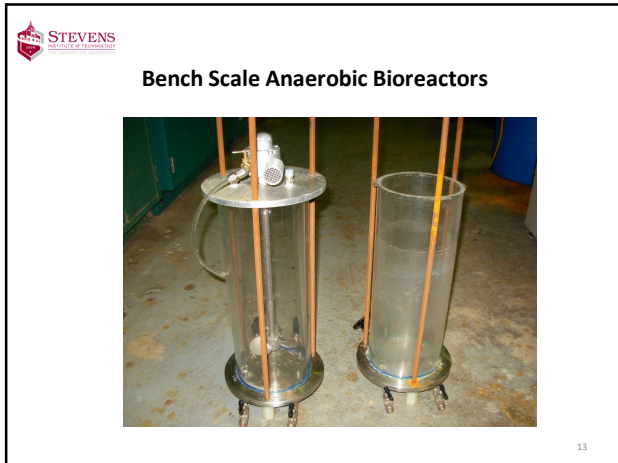
- In 1998 NREL conducted a study funded by DOE in 30 metropolitan areas
- Metropolitan areas ranged in size from Bismarck, North Dakota (population 83,831) to Washington, DC (population 3,923,574).
- Desk Study based on NREL estimates & Census Data conducted to estimate Bergen County's Brown Grease Generation Rate

Addition of Co-Substrates

How do you know the co-substrates will function in a digester?

- Feed the AD & cross your fingers
- Literature Research
- Laboratory Bench Scale Testing
- Computer Modeling
- Pilot Demonstration





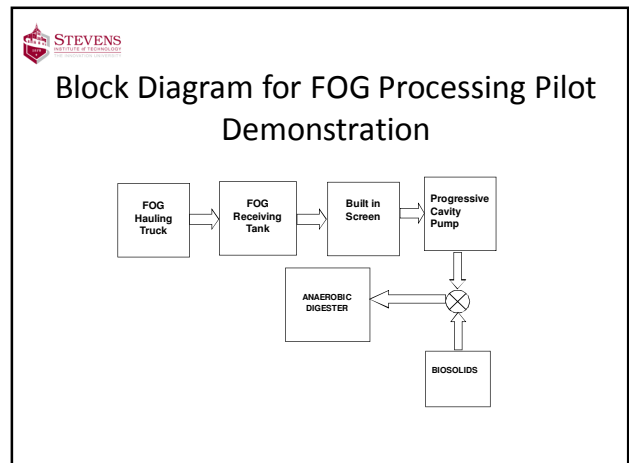
Theoretical FOG Biogas Production

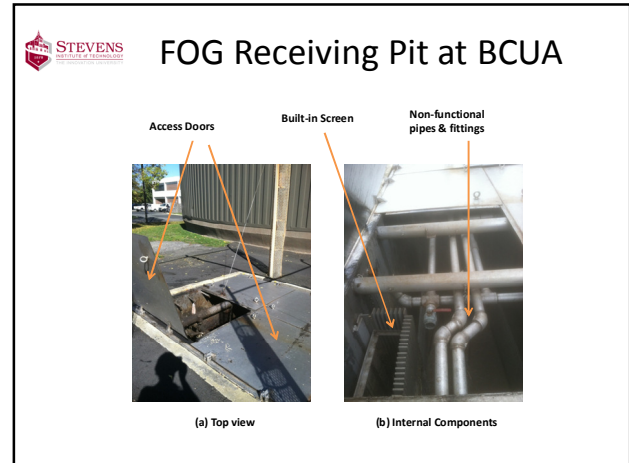
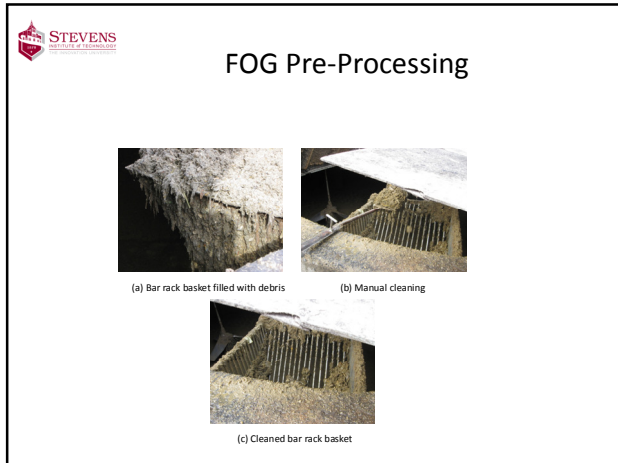
$$C_{37}H_{104}O_6 + 28 H_2O \xrightarrow{\text{Anaerobic Digestion}} 40 CH_4 + 17 CO_2$$

This corresponds to 70% methane & 30% Carbon Dioxide

Under STP, 1 mole of FOG produces 948 Liter of Methane.
This translates to 17.2 SCF per pound of digested FOG

Luostarinen et al (2009) reported 14.7 SCF/Lb VS





Average FOG Characteristics

Parameter	Unit	Value
Total Solids	%	8
Water Content	%	92
TVS/TS Ratio	%	95
Specific gravity	[-]	1.0024
Density	Lb/gal	8.36
pH	SU	4 - 5

Pilot Study Results


- Addition of FOG as a co-substrate increases significantly biogas production.
- FOG can easily be fed as a co-substrate to the existing anaerobic digesters
- Co-digestion of FOG results in the production of 8.2 SCF of biogas per gallon of FOG.
- Value compares very well with the 7.3 SCF biogas per gallon of FOG obtained during pilot testing at the Sacramento Municipal Utility District (SMUD) wastewater plant in California

Environmental Benefits

- Less CO₂ Emissions from shorter truck haul routes
- Renewable energy replaces energy from fossil fuels
- Less CO₂ than landfilling.
- Less CO₂ and energy production as compared to current use of FOG as auxiliary fuel in sludge incinerators
- Reduction of sewer blockage

Conclusions

- Increased biogas methane generation, along with energy and economic benefits;
- Receiving tipping fees for handling these materials;
- Minimizing sewer grease buildup and clogged sewers
- Reduction of GHG Emissions



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QUESTIONS ?

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