

Best Practices in Organic Co- digestion for Municipal Wastewater Treatment Plants

Growing Sustainable Communities
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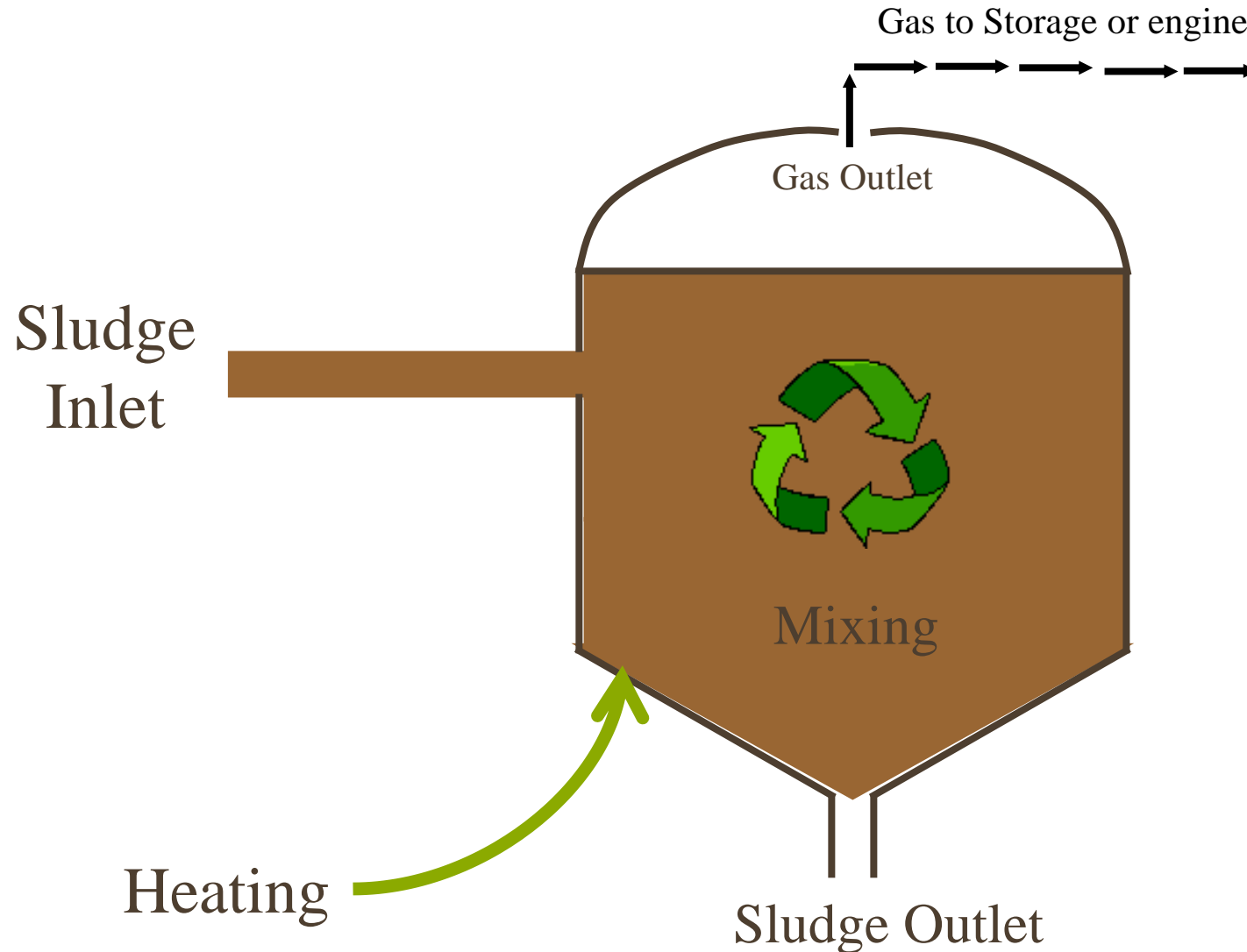


Agenda

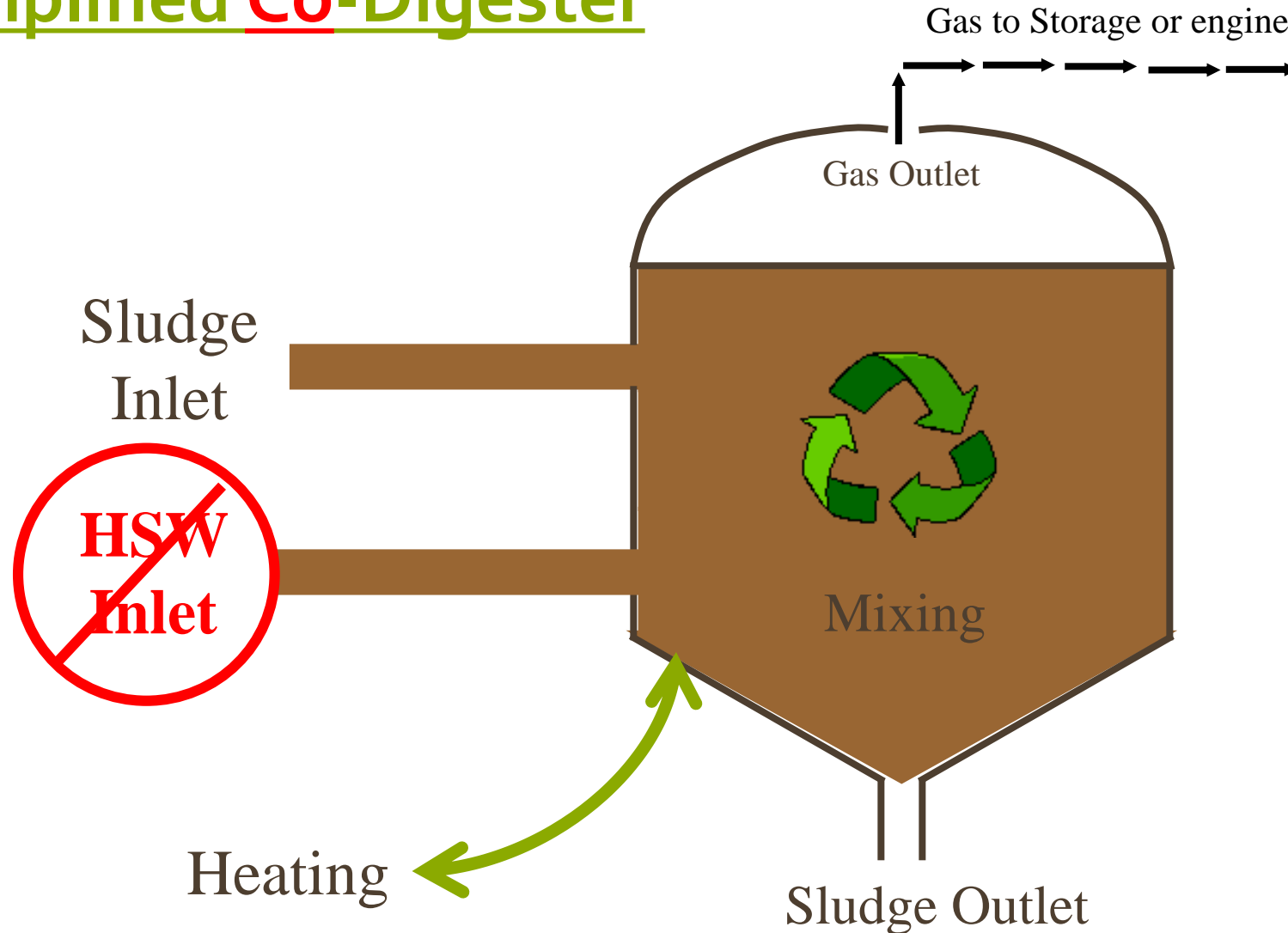
- What is Anaerobic Digestion and Why Do it?
- Why put organics there?
- What works/What does not?

Simplified Digester

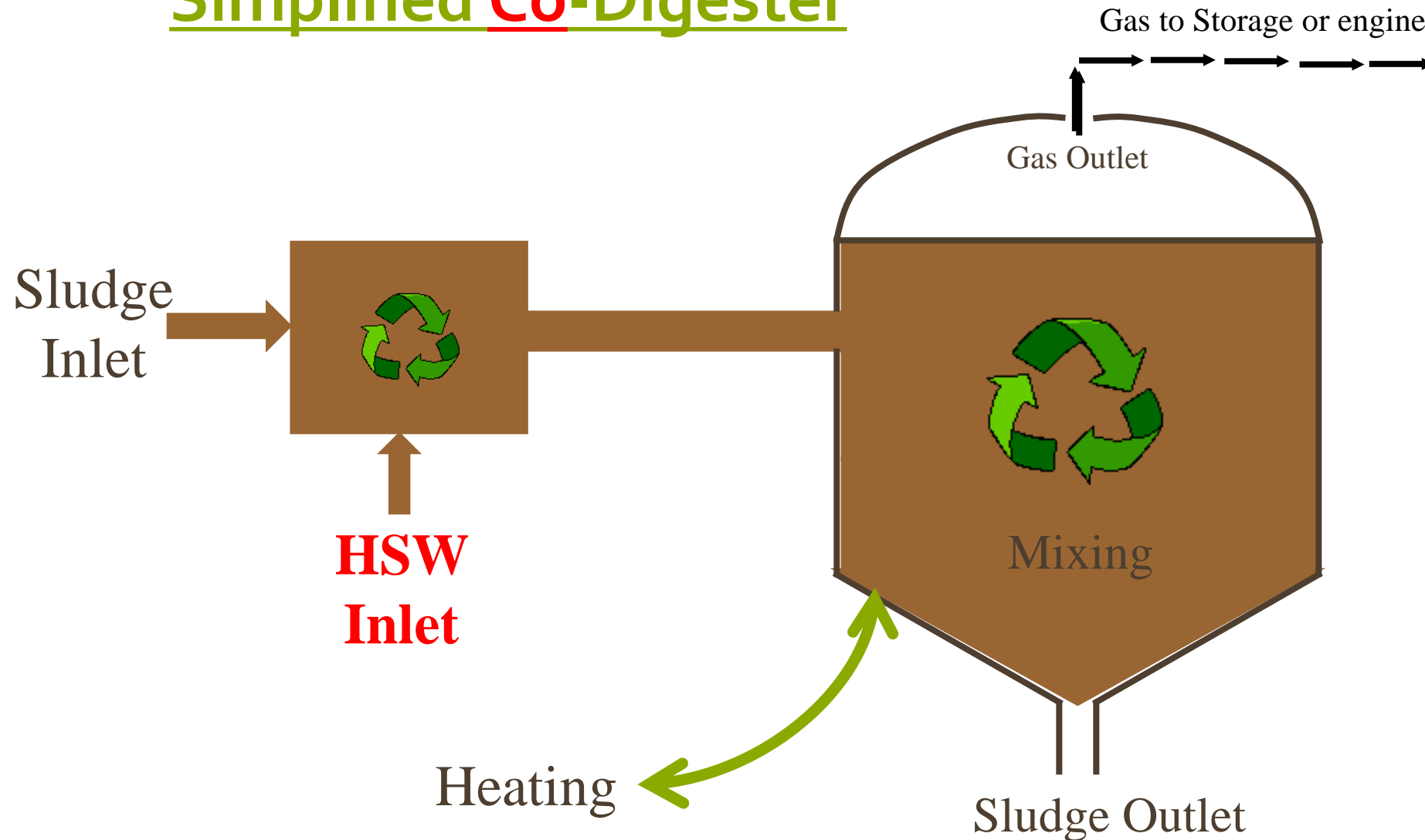
(Complete mix, mesophilic, pancake tank)



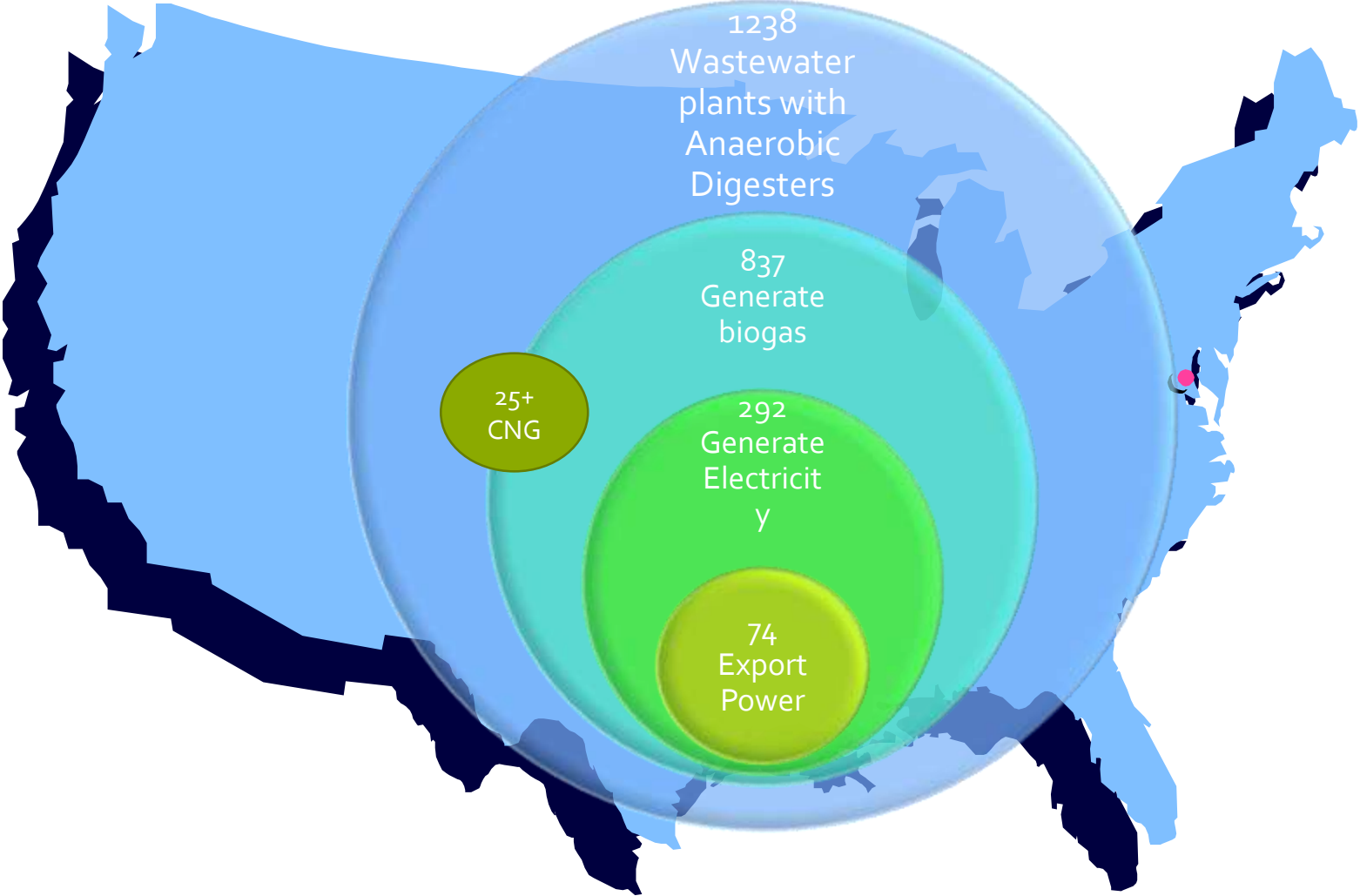
Simplified Co-Digester



Simplified Co-Digester

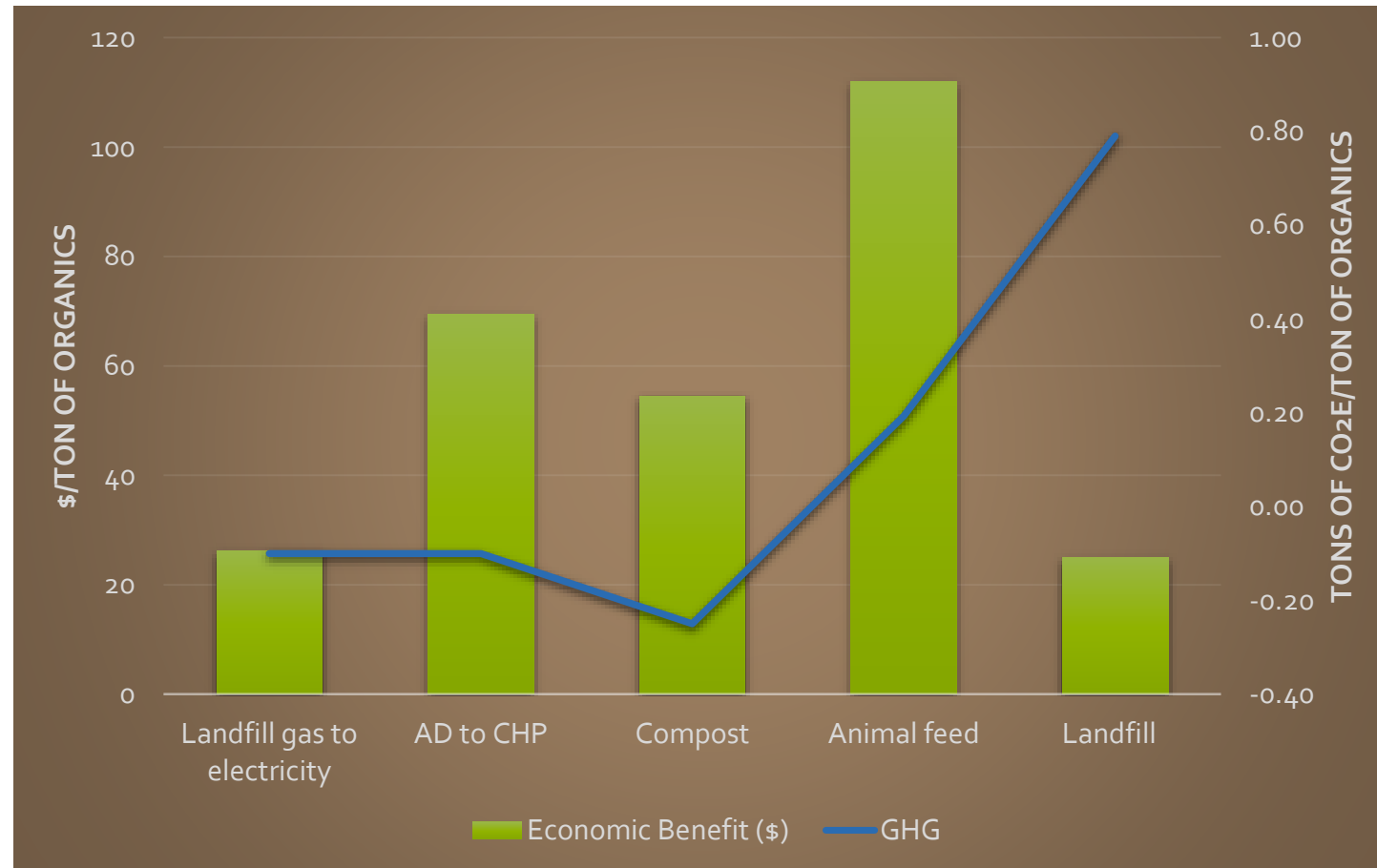


US Biogas Data – Municipal Wastewater



Source: Water Environment Federation

Comparison of organic disposal options



Receiving Stations

Key Points

- How to get out of the truck and into the digester?
- Make it commercially friendly
- Ease of maintenance + longevity of materials

FOG Receiving Station (pumpable organics)



Winchester, VA



Gresham, OR

Solids Receiving Station (non-pumpable)



Live Bottom Hopper suitable for biosolids (not good for food)



What shows up



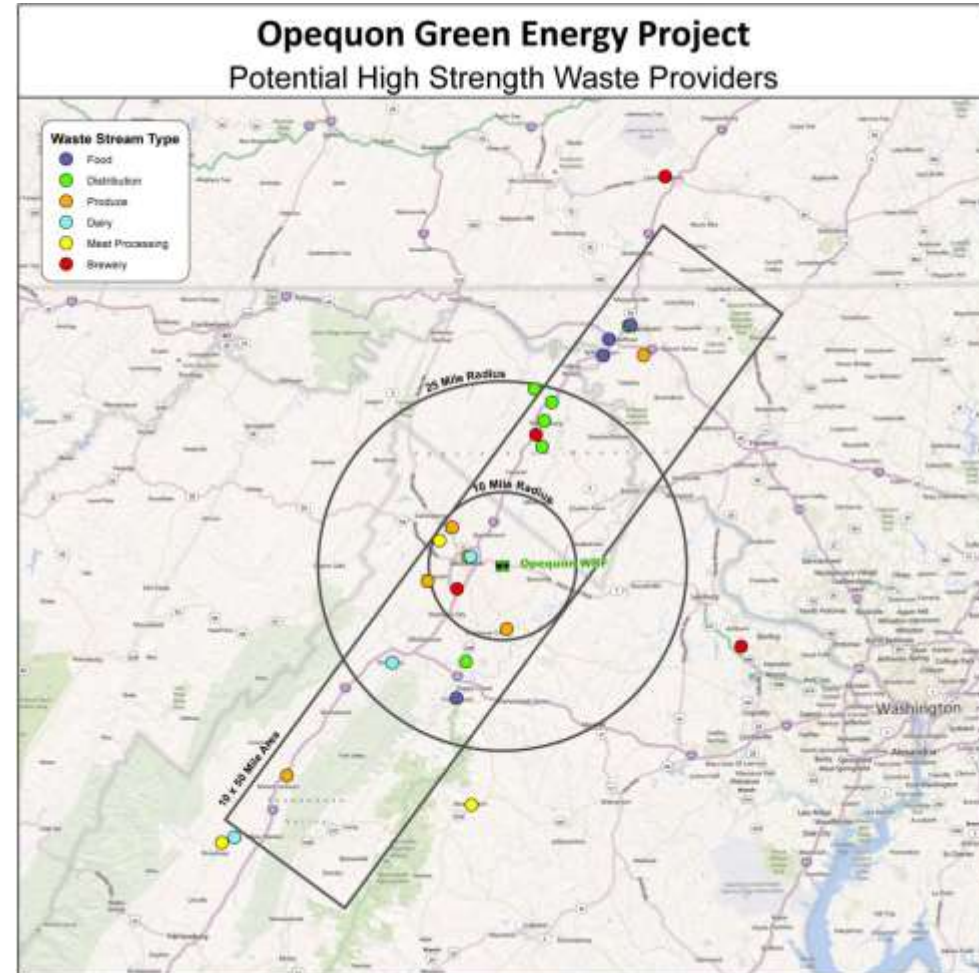
What goes into digester



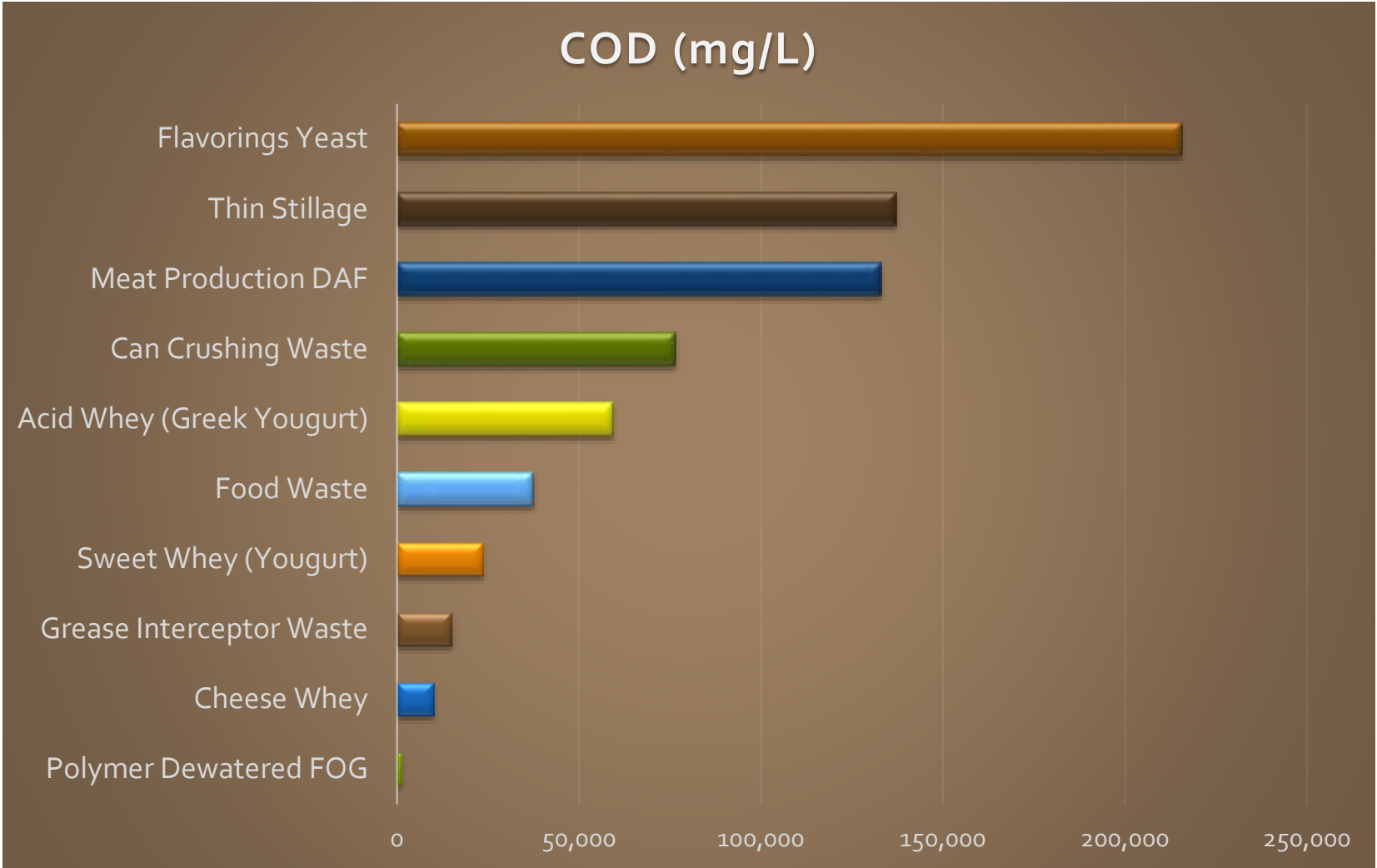
Screw Press / Extrusion

HSW Market Study

- (2) Large Local Sources
- Multiple others within 60 miles



Not All Waste is the Same



Overview of Generating Energy From Organics, Kobouris, 2014 WEF Planning a Codigestion Program
High Strength Organics Codigestion Program Examples, Kabouris, 2014 WEF Planning a Codigestion Program

Risk Mitigation

- Understand your local marketplace for sources
- Find partners/sources/haulers of waste
- Sign up long term, 3 – 10 years
- Devote resources to manage incoming and receiving
- Steal good ideas from others

Mixing

Key Points

- Mix storage tanks
- Precondition by mixing with WAS/Primary Sludge
- Complete mix digester

Anaerobic Digester Mixing

- Provide regular mixing
- Need to bring food (volatile solids and volatile acids) into contact with bacteria
- Good mixing, along with heating, will help to assure a good digestion rate
- Mixing critical to good operation
- Mixer not working – you must lower feed rate
- Three most important things about digester operation: mix, mix, and mix

Gas Mixing Systems

- Sequential discharged lances
- Floor mounted diffusers
- Draft tubes
- Bubble guns
- Gas compressor is the heart of all of the above, recirculating biogas for mixing



Mechanical Mixing Systems

Propeller

Usually mounted in a draft tube

Some tangentially aimed nozzles

Pumped recirculation system

Pump draws sludge from tank and discharges through nozzles

Linear Motion: low HP disk

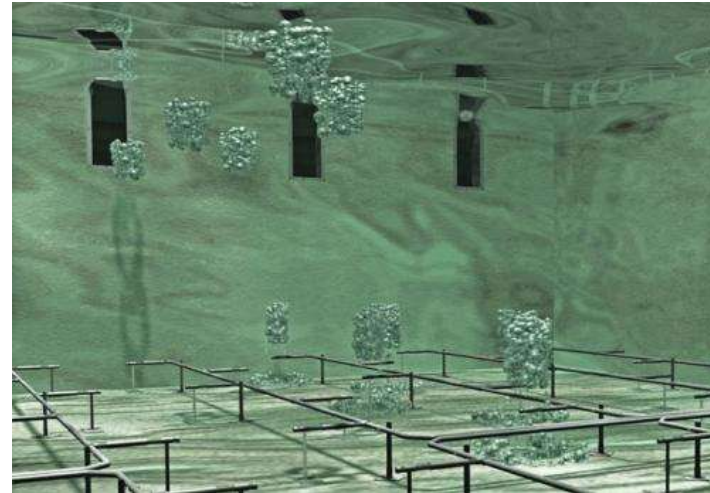
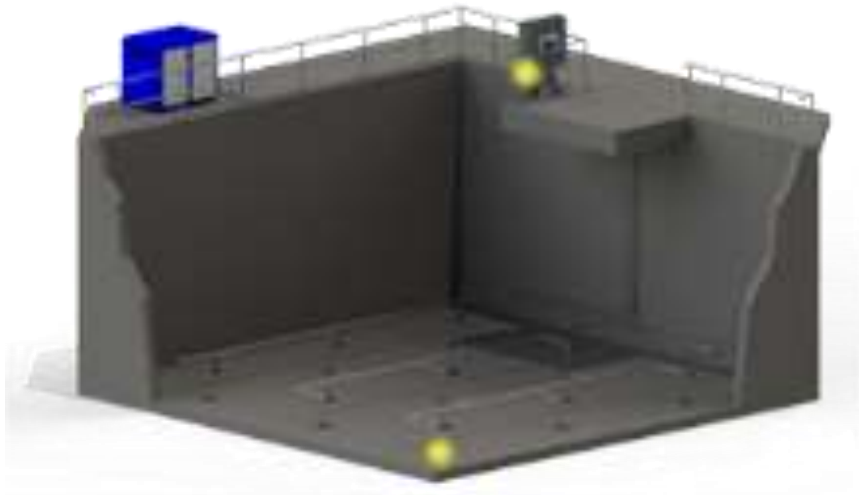


Linear Motion



Jet Mix Nozzle

Compressed Air – for storage tanks



HSW Storage Mixing
(large bubble)



Operation

Key Points

- Steady homogenous feed
- Methane (CH₄) value
- Alkalinity



Flow meter w/CH₄ sensor

Normal Anaerobic Digestion

- Feed of primary and WAS sludge only
- The total solids and volatile solids content of sludge sent to the digester at a WWTF doesn't vary by much
- If you have a 1.5 MG primary digester, as long as you pump <100,000 GPD operation usually OK since Hydraulic Loading Rate (HLR) = 15+ days
- Still should do more process control testing

Co-Digestion Feeding

- High strength organic waste varies considerably
- Chemical Oxygen Demand (COD) of 50,000 mg/l to >800,000 mg/l results wide range depending upon food source
- Need to know organic strength of HSOW
- COD testing a fast screening tool of organic strength



Other things to keep in mind:

- Know the strength of the organic waste going into your digester
- Process control testing and calculations more important in co-digestion systems
- Conduct process control tests 2 to 3 times per week for a stable digester, more frequent during startup operation
- Create a database of all information so trends and historical information is retained

Things to avoid

- Rock traps for oily waste
- Unmixed, unheated storage tanks
- Lack of onsite storage for trucked waste
- Improper feeding of digester
- Not managing relationships with haulers

Key Points for success

- Receiving stations
- Mixing
- Operation



Thank you

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