

BIOSOLIDS TECHNOLOGIES SNAPSHOT



FDEP BIOSOLIDS TECHNICAL ADVISORY COMMITTEE

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Discussion Overview

- **Biosolids Quality & Characteristics**
- **Stabilization/Treatment Technologies**
Class AA Technologies
- **Innovative & Emerging Technologies**

Biosolids Quality & Characteristics

Related Definitions

- **Sludge** - solid, semisolid or liquid untreated residue generated during the treatment of domestic wastewater in a treatment facility.
- **Residuals** - solid, semisolid or liquid residue generated during the treatment of domestic wastewater in a treatment facility.
- **Biosolids** - nutrient-rich organic materials resulting from the treatment of sewage sludge. When treated and processed, these residuals can be recycled and applied as fertilizer to improve and maintain productive soils and stimulate plant growth.

» Source: US EPA

Biosolids Quality & Characteristics

Regulatory Stabilization Levels

- **Class B** - Biosolid that has been treated via a process to significantly reduce pathogens

Fecal Coliform < 2,000,000 mpn regulatory limit
(18,000 mpn was avg from study of facilities)

- **Class A** - Biosolid that has been treated via a process to further reduce pathogens

Fecal Coliform <1000 mpn regulatory limit
(30 mpn was avg from study of facilities)

- **> 99% removal on fecal coliform**
- **Class AA** - Class A biosolid with metal concentrations below average limits

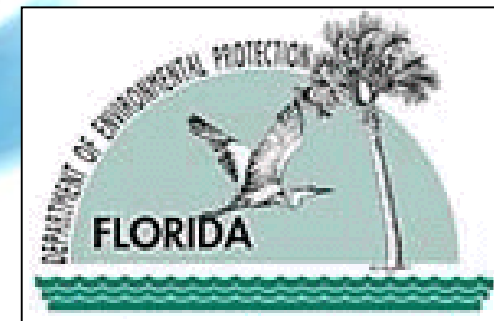
Source: Florida Administrative Code



Biosolids Quality & Characteristics

Biosolids Disposition from Facility

- **Distributed/Marketed – Class AA**
- **Renewable Energy - Class AA**
- **Construction Material - Class AA**
- **Land Application – Class B or AA**
- **Landfill – Unclassified, Dewatered**



Biosolids Quality & Characteristics

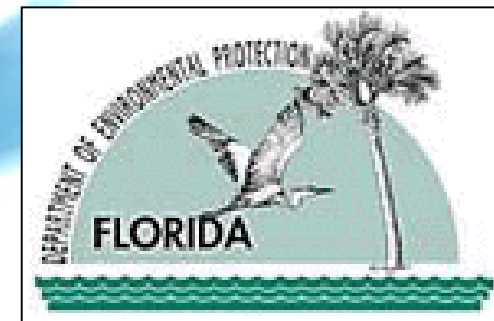
Biosolids Disposition to Technology

Disposition method drives Stabilization Level

**Marketable Biosolid Product or Bioenergy Source
need to achieve Class AA**

versus

Landfill can be unclassified and untreated



Stabilization/Treatment Technologies

Class AA Processes in FL *(partial list)*

- Chemical Neutralization
- Advanced Alkaline Stabilization w/Reactor
- Aerobic-Anaerobic Advanced Phased Digestions (ATAD/2PAD)
- Composting
- Drying



Stabilization/Treatment Technologies

Chemical Neutralization Process

- 2-stage chemical treatment system, thicken biosolids and apply six chemicals for 8 hr processing time
Sodium chlorite/Sulfuric acid/Sulfuric acid/Sodium nitrite/Sodium hydroxide/Ferric sulfate
- Chemical injection to disinfect, stabilize, bind TP
- Class AA dewatered residual (20%+)



Stabilization/Treatment Technologies

Chemical Neutralization in FL (partial list)

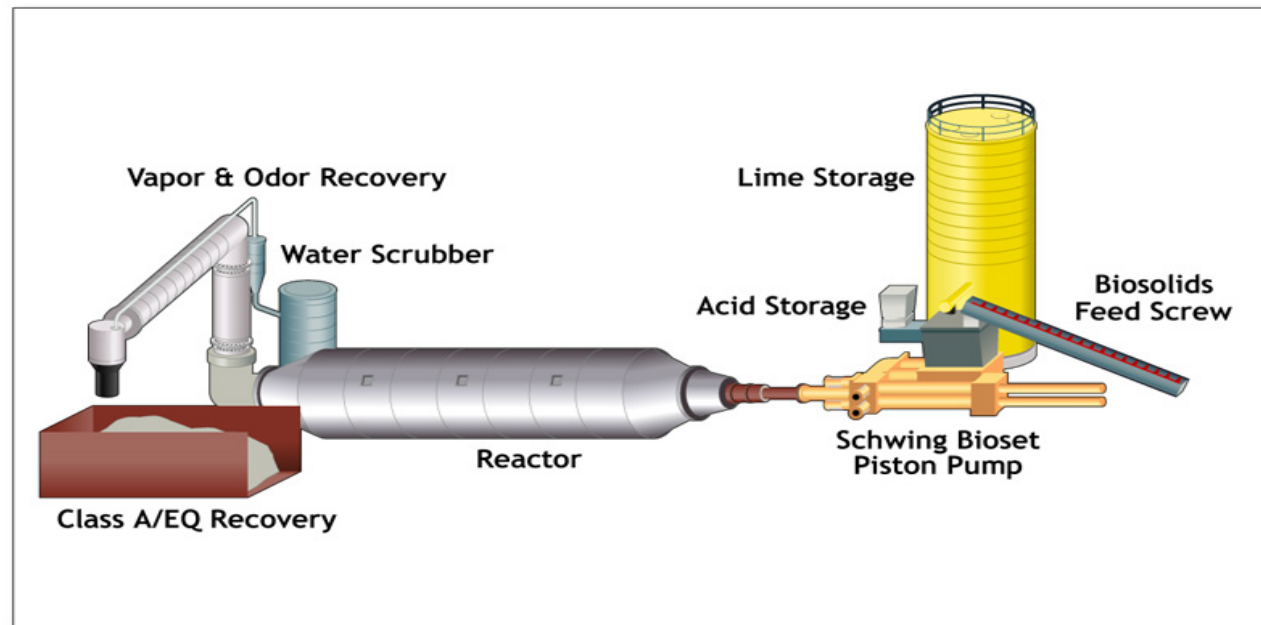
- Clay County
- Haines City
- Martin County
- Deltona
- Pembroke Pines



Stabilization/Treatment Technologies

Advanced Alkaline with Reactor

- Quicklime and sulfamic acid added to biosolids create exothermic heat generation in reactor elevating temp and pH >12
- Entraines ammonia inside the reactor for pathogen kill
- Temp of 55 degrees C for 40 minutes



Advanced Alkaline with Reactor (partial list)

- Orlando
- St. Petersburg
- Hollywood
- Immokalee



Stabilization/Treatment Technologies

Aerobic/Anaerobic Advanced Phased Digestions

Autothermal Thermophilic Aerobic Digestion (ATAD)

- Temperature: 65 degree C avg operation (thermophilic) > 55 degree C required
- 27 day operating SRT
- Class A liquid residual (2-3%) dewatering issues



ATAD Installations in Florida

- Lakeland – (1 of 2 systems)
- Titusville – (1 of 2 systems) Hauling liquid to land apply
- Sunrise – (Taken offline aesthetic issues)



2PAD - 2 Phased Anaerobic Digestion

- Lakeland – (1 of 2 systems)
- St. Petersburg in future for energy generation

Composting Process

- Biosolids and bulking carbon source like vegetation, yard waste
- Common types - windrow, aerated static pile, in-vessel
- Organic materials microbial breakdown into a Class AA nutrient-rich soil conditioner
- Composting biosolids reduces bacterial and viral pathogens to non-detectable levels if the temperature is maintained at greater than 55 degrees C for 3 days or more



Composting Installations (partial list)

- Charlotte County
- ECUA
- Hillsborough County
- Indian River County (Fellsmere)
- Lee County
- Reedy Creek - Disney (offline)
- Sarasota (offline)
- Sumter County
- *(Few more in permitting)*



Stabilization/Treatment Technologies

Drying Process

- Biosolids are mechanically dewatered prior drying
- Direct or indirect dryers evaporate off water to greater than 90% dry solids (volume reduced by 5 times)
- Biosolids are dried into a Class AA nutrient-rich product
- Alternative energy sources can be important to assist with dryer operating costs



FDEP Biosolids TAC

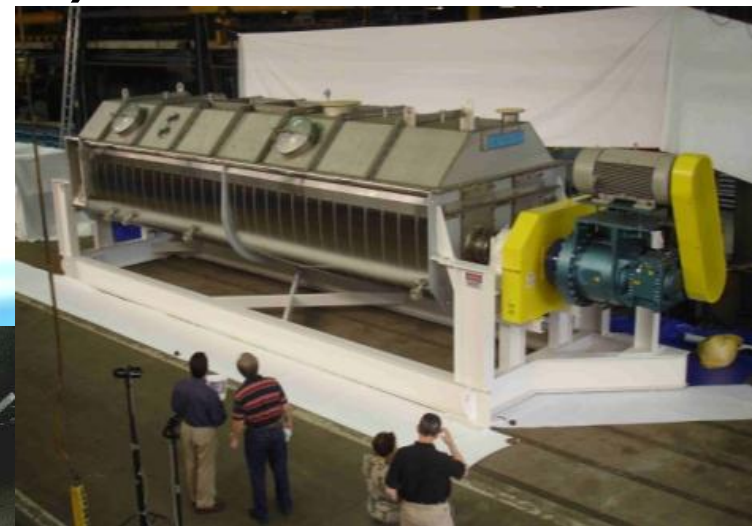


Pinellas County, FL

Stabilization/Treatment Technologies

Gas Dryer Installations (partial list)

- Bonita Springs
- Jacksonville (JEA)
- Largo
- Manatee County
- Ocala
- Palm Beach County
- Pasco County
- Pensacola (ECUA) Offline
- Pinellas
- San Destin
- Tallahassee
- Tampa
- Green Edge
- H&H
- Wellington



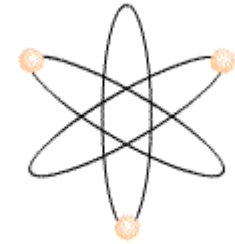
Stabilization/Treatment Technologies

Solar Dryer Installations (partial list)

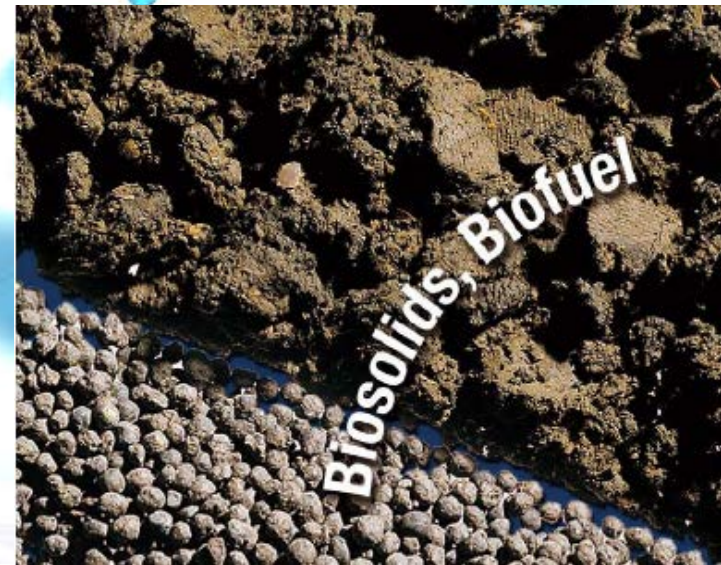
- Okeechobee (Solar)
- Cocoa Beach (Solar)



Renewable Energy



- **Bioenergy** - renewable biomass to create energy
- **Biomass** can be a very desirable energy source
- **Biosolids** are a readily accessible and predictable biomass source (Dried biosolid product contains greater than 50% of coal heat value)
- **Biogas** availability



Innovative & Emerging Technologies

Biogas Energy Source for Drying

Manatee County, FL

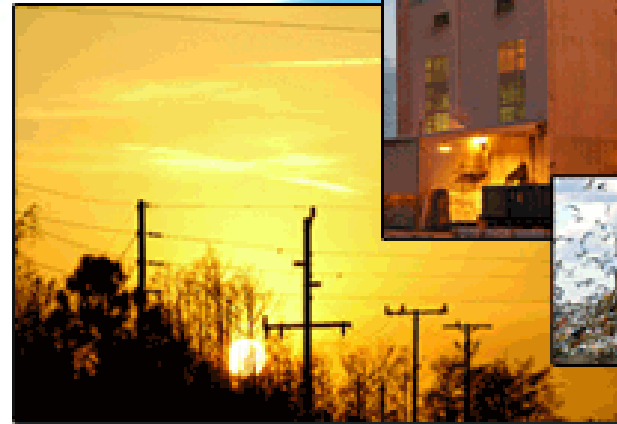
Drum dryer system that uses landfill methane gas or natural gas.



Manatee County, FL

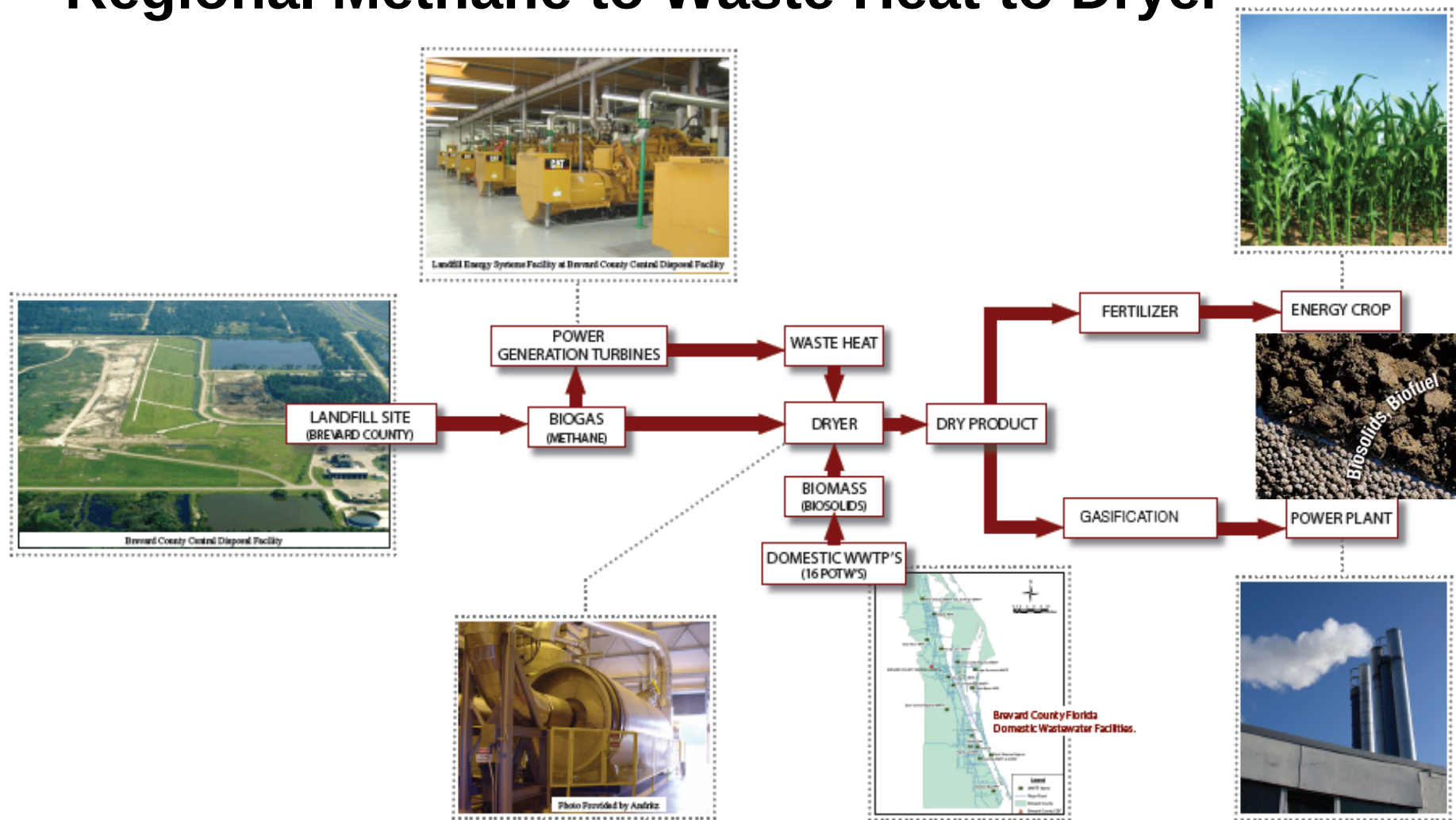
Palm Beach County, FL (SWA)

Drum dryer system that uses two burner trains to fire landfill methane gas or natural gas.

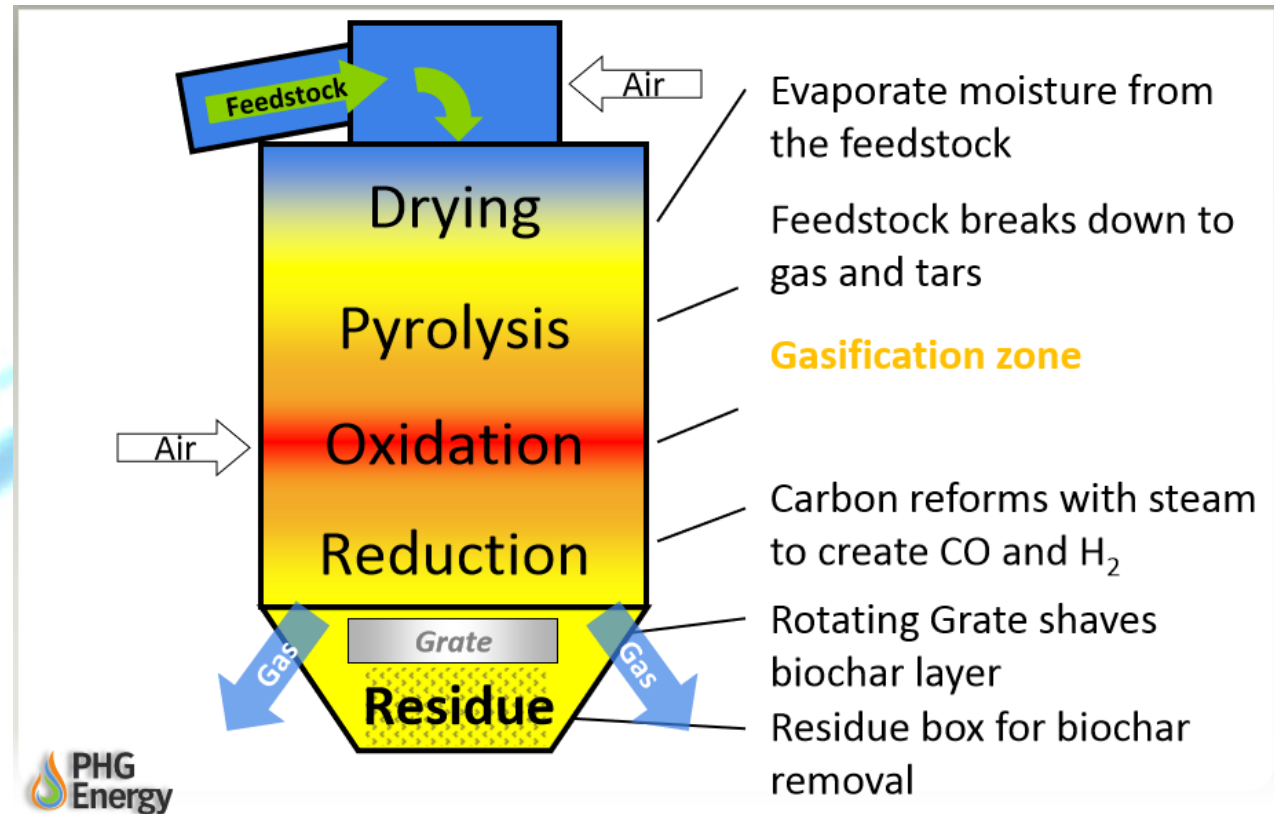


Innovative & Emerging Technologies

Biogas to Waste Heat Drying Regional Methane to Waste Heat to Dryer



Gasification Biosolid/Biomass



- Thermal process involving the reaction of waste under limited oxygen conditions at 500 to 1400 °F
- Converts energy contained in biomass (biosolids) into syngas (H₂, CH₄, CO, CO₂) which can be used to generate power

Innovative & Emerging Technologies

Emerging
Technology

Gasification Systems

Biosolids plus wood wastestream

Lebanon Tennessee



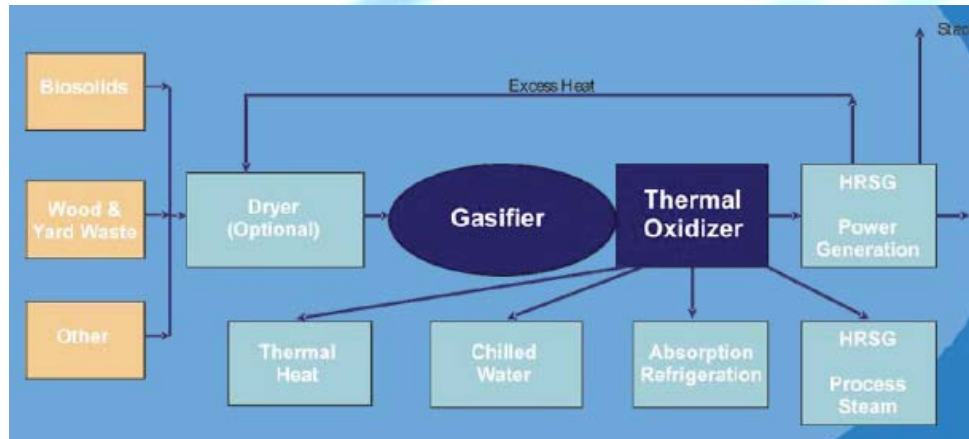
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Univ. of South Carolina

Gasification of Biosolids

Sanford, Florida

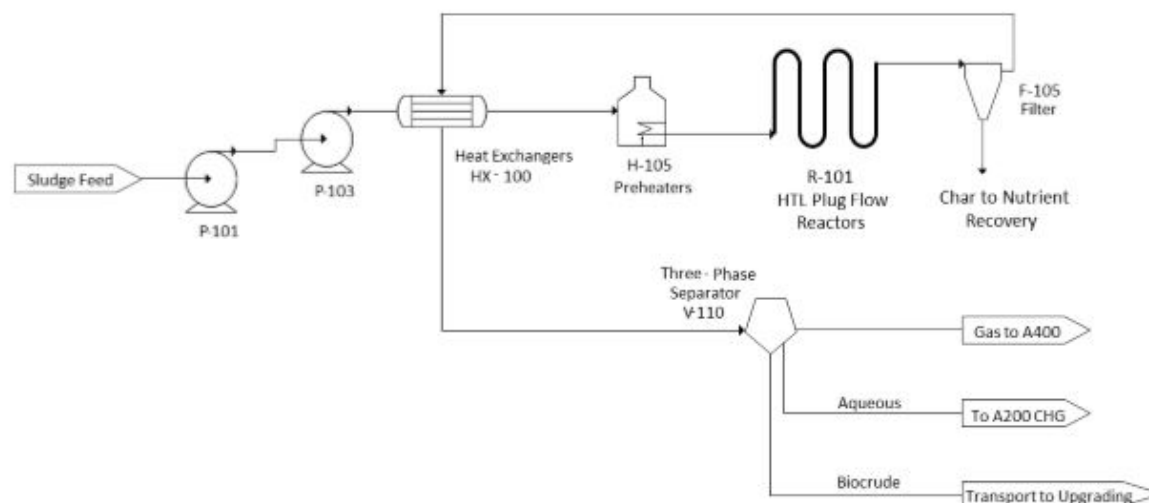
- Biosolid Drying – replaced/tried multiple dryer systems
- Gasification Process follows Biosolid Drying
- Gasification system tried for a few years but never ran successfully to produce power from biosolids
- Gasification company no longer in business



Hydrothermal Liquefaction

Emerging
Technology

- Combustion of organic waste @ Temp up to 700°F & Press up to 4,000 psi
- Technology in aqueous based biomass environment
- Municipal sludge, algae, food waste are organic feedstock
- End Products: 40% Biocrude fuel, 34% Aqueous w/High Organics, 20% Gas
- Technology is Laboratory bench scale and pilot scale level
- Daphne, AL - Commercial start-up company called Algae Systems had a DOE funded demonstration facility that operated in 2014 and 2015 growing algae in photoreactors and using the algae as a feedstock for a hydrothermal liquefaction process producing a biocrude fuel. (<http://algaesystems.com/>)



New Technologies

Emerging
Technology

- Anuvia – High temperature fertilizer process that uses biosolids as a cooling agent/ingredient in a fertilizer type (private Biosolid Treatment Facility in Zellwood, FL)
- Harvest Energy – Anaerobically digests biosolid and food wastestreams to generate power. Heat drying remaining to Class AA (Orlando, FL)
- Vermicomposting – Tested for applications on biosolids. No full scale applications emerged (Orlando and Cocoa, FL)



Supercritical Water Oxidation Emerging Technology

- Solution operating at critical High Temperatures and Pressures
- Orlando Pilot Test
- Never completely successful
- Process explosion
- Orlando switched to Advanced Alkaline with Reactor
- Michael Hudkins to discuss further

Most people don't realize that William Shakespeare was talking about biosolid issues in Hamlet...

*"TO "B" OR NOT TO "B" (CLASS AA)
THAT IS THE QUESTION?"*



**Biosolids Management, well at least it hasn't
come to this...**

THANK YOU!



Any Questions?

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