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To Digest or Incinerate Sludge…That is the Question

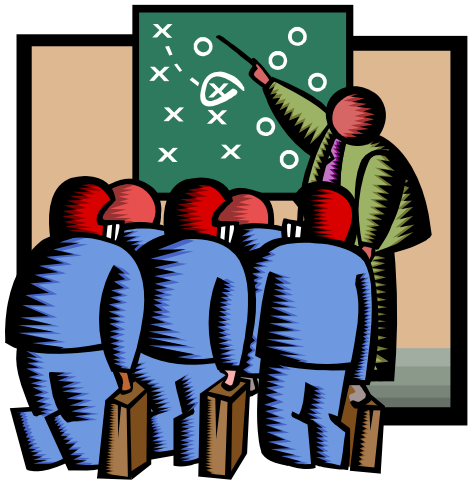
Mark Greene, O'Brien & Gere

One Water

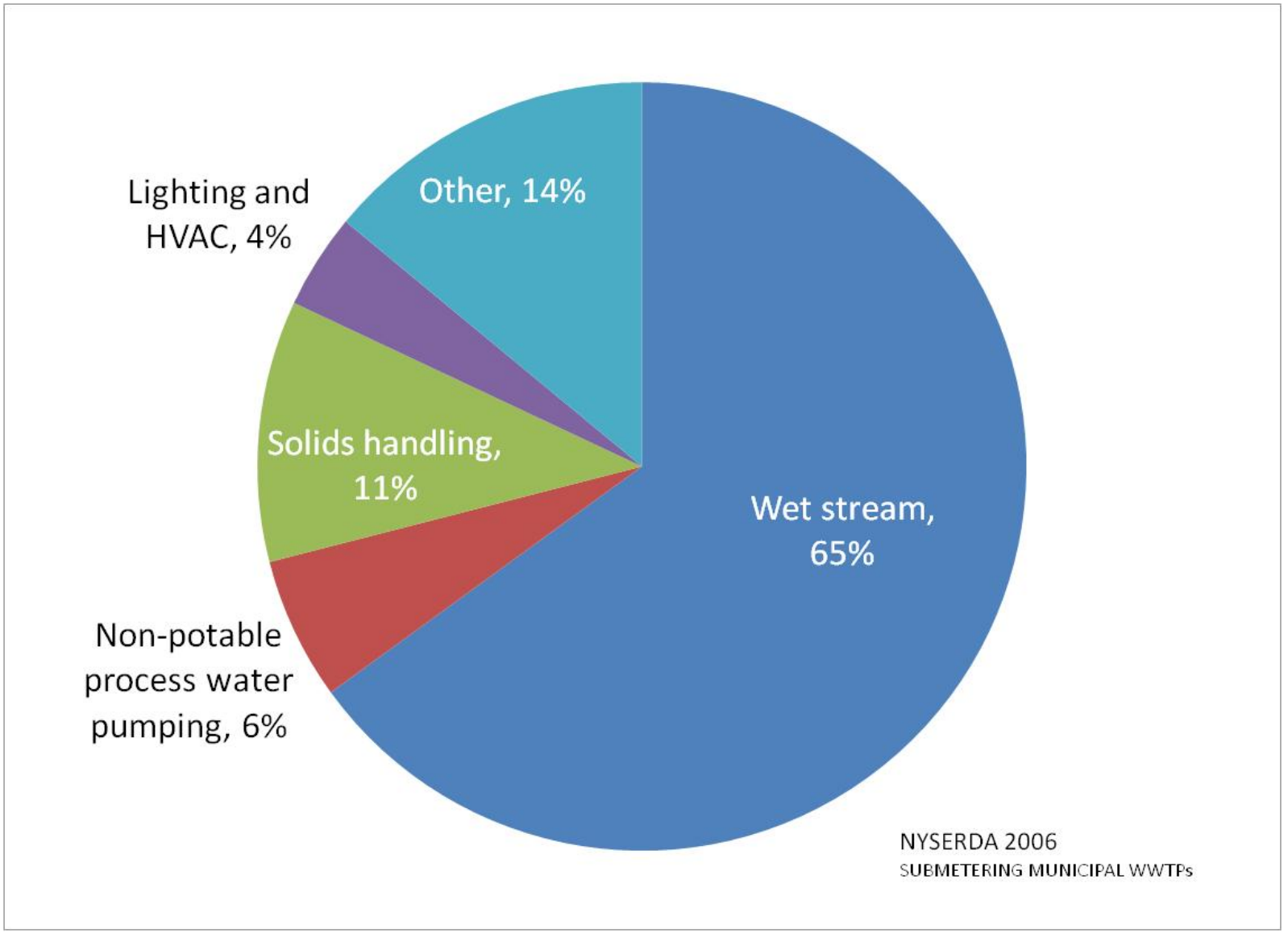
O'BRIEN & GERE

Today's Presentation

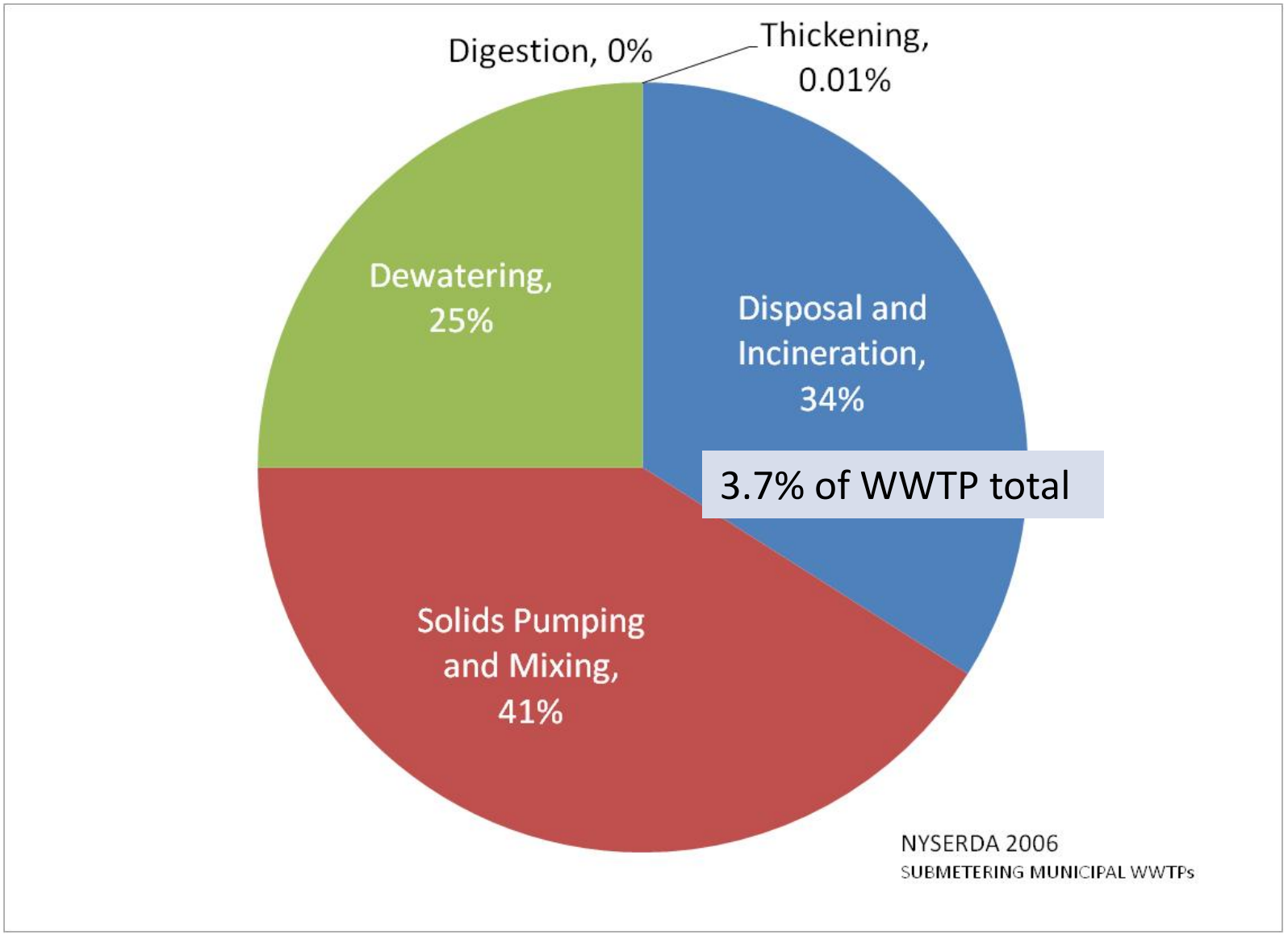
- Statistics
- Incineration Basics
- Anaerobic Digestion Basics
- SWOT
- Moving Forward



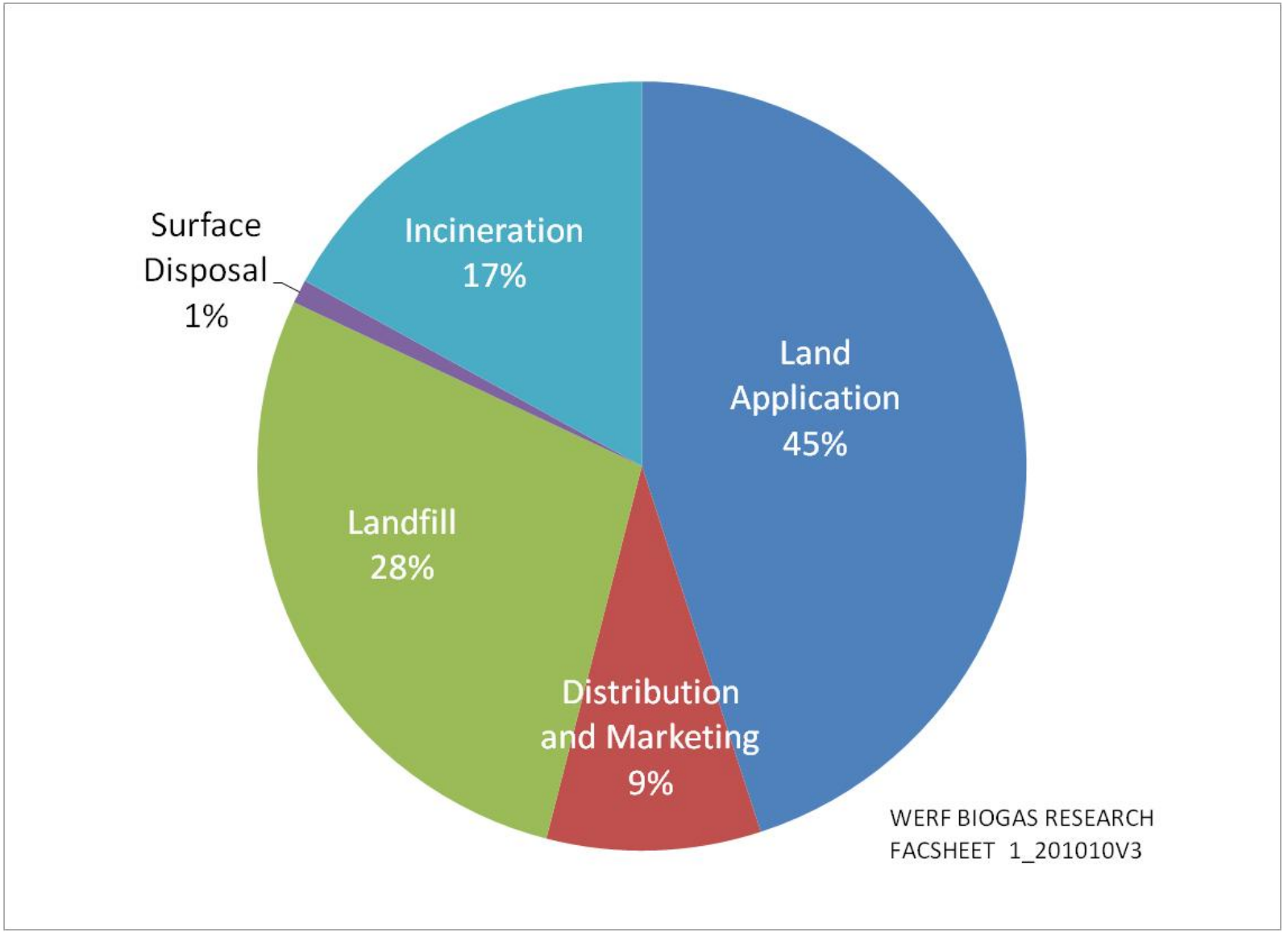
Energy Usage Distribution By Treatment Process Train



Energy Usage Distribution Within Solids Handling Stream



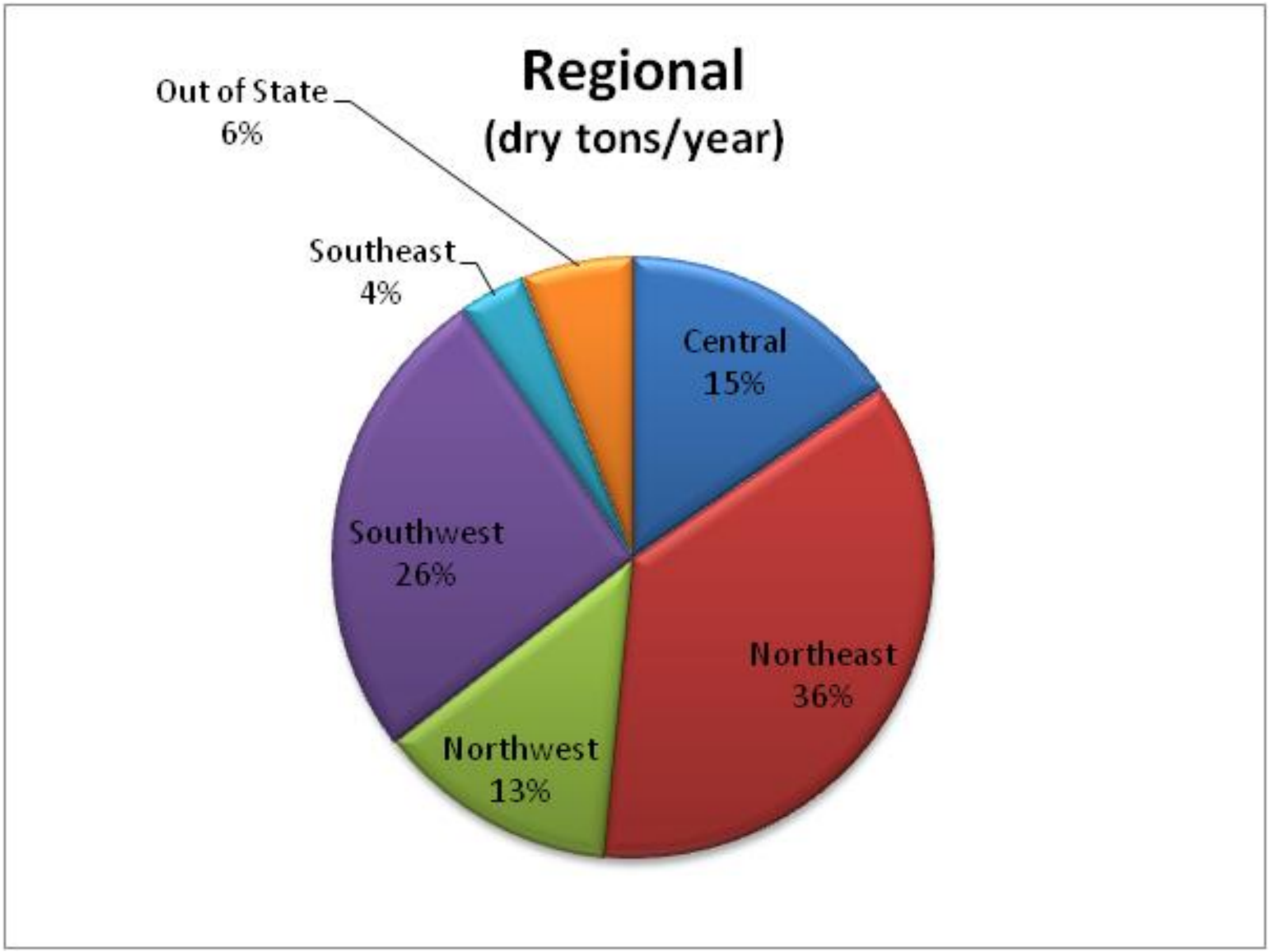
US Biosolids Disposal Practices



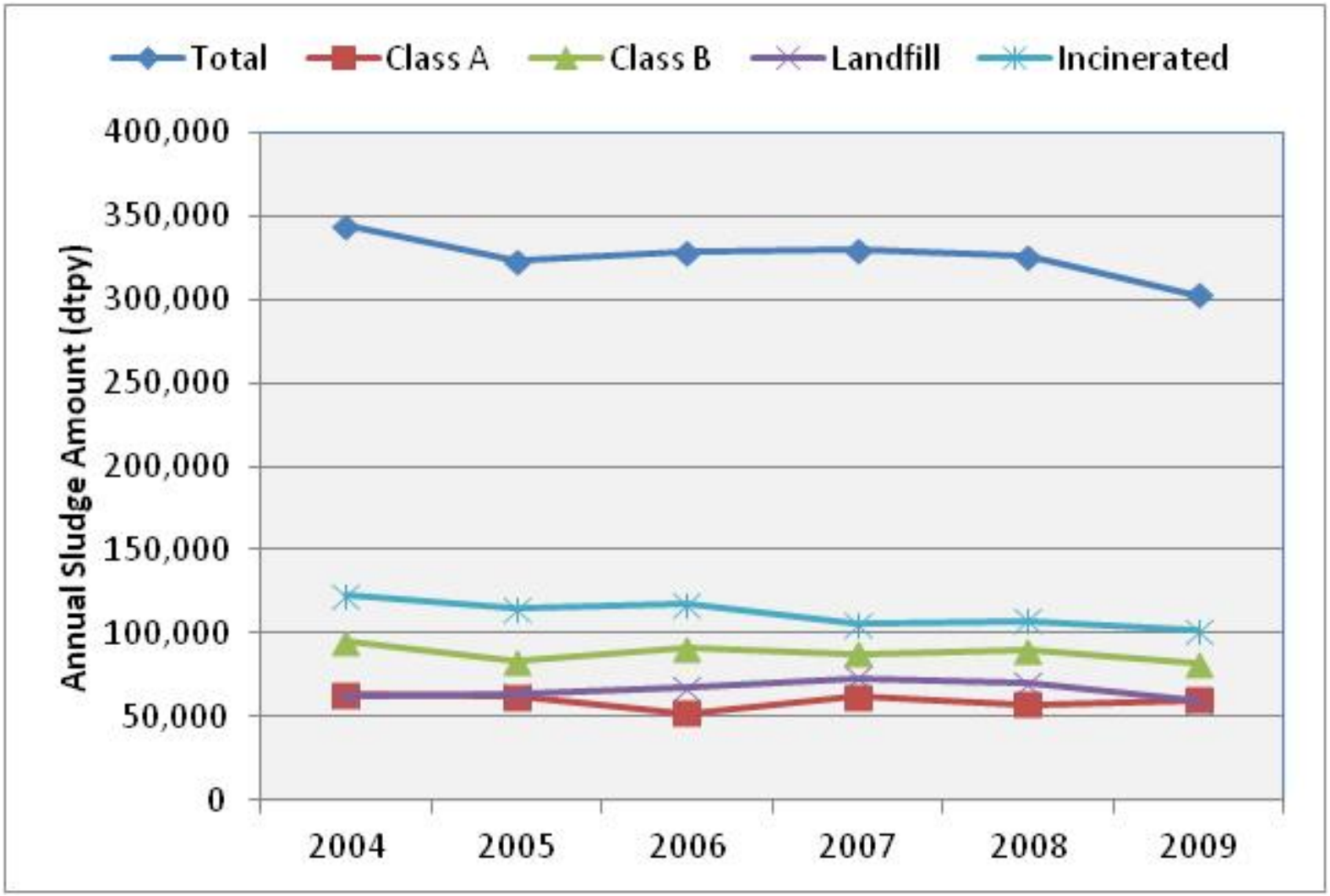
Ohio Sludge Disposal Practices

- 2002 – Ohio EPA establishes sewage sludge regulations
  - Ohio Administrative Code rule 3745-40
- 2005 – Ohio EPA receives EPA delegation for the sewage sludge program.
  - 1 of only 7 States
- 2011 revised rules
- 2003-2009 biosolids reports
  - 30% of facilities process 90% of the biosolids

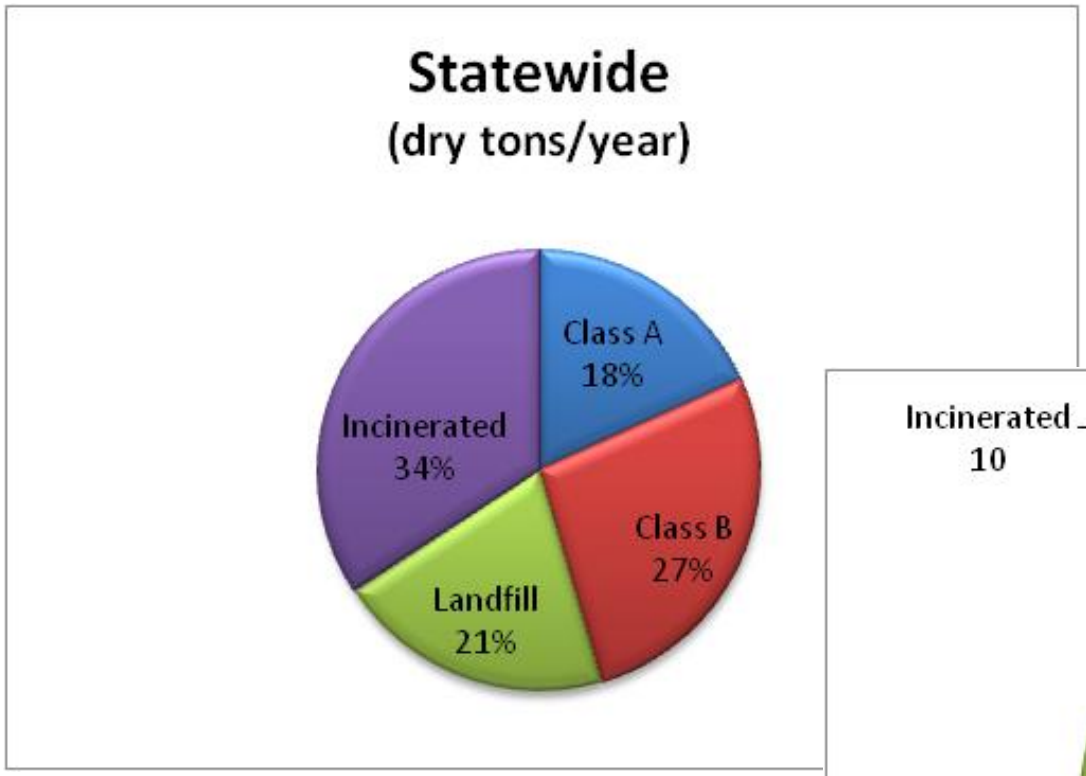
Ohio Biosolids Generation (2004-2009)



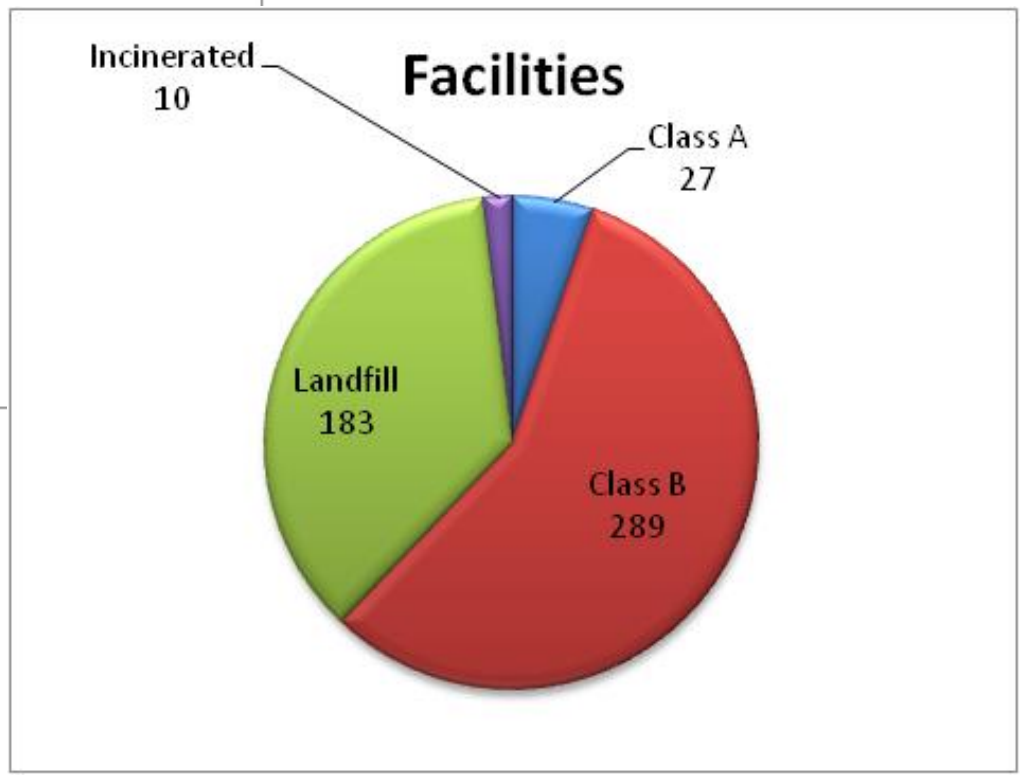
Ohio Biosolids Disposal Practices (2004-2009)



Ohio Biosolids Disposal Practices (2004-2009)



Beneficial reuse requires sludge stabilization

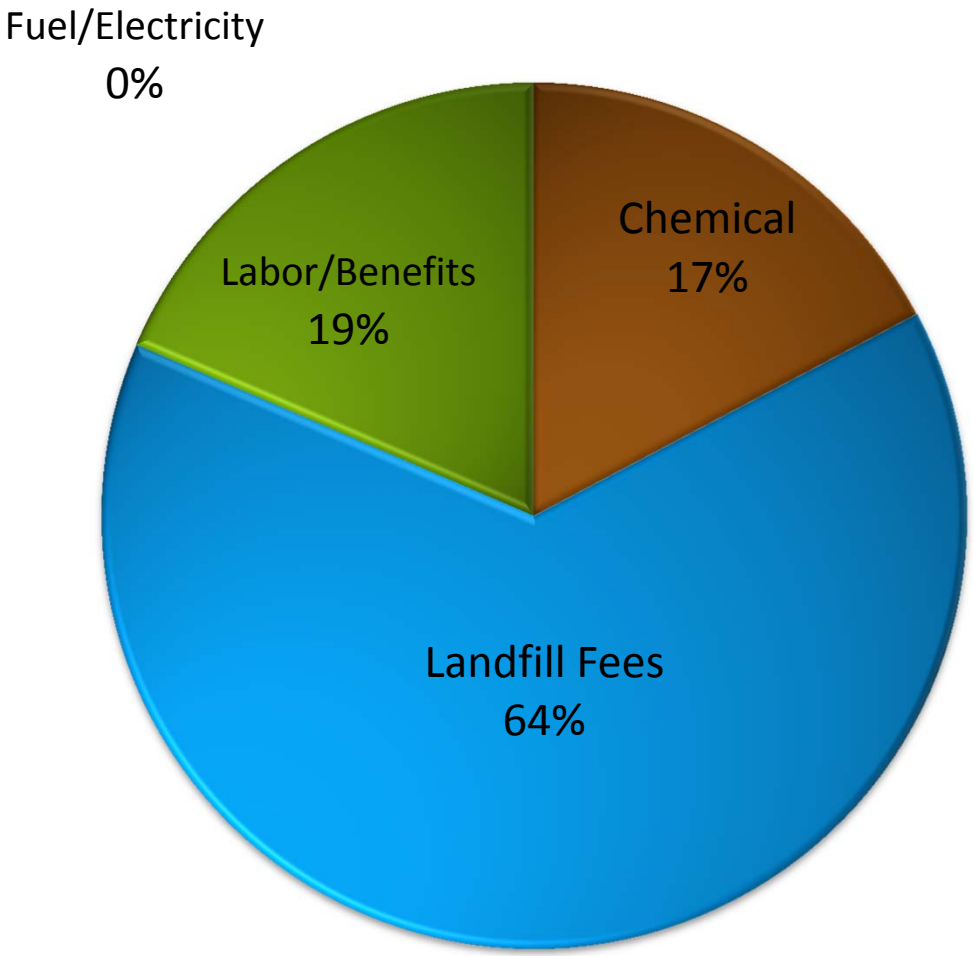


How to Stabilize?

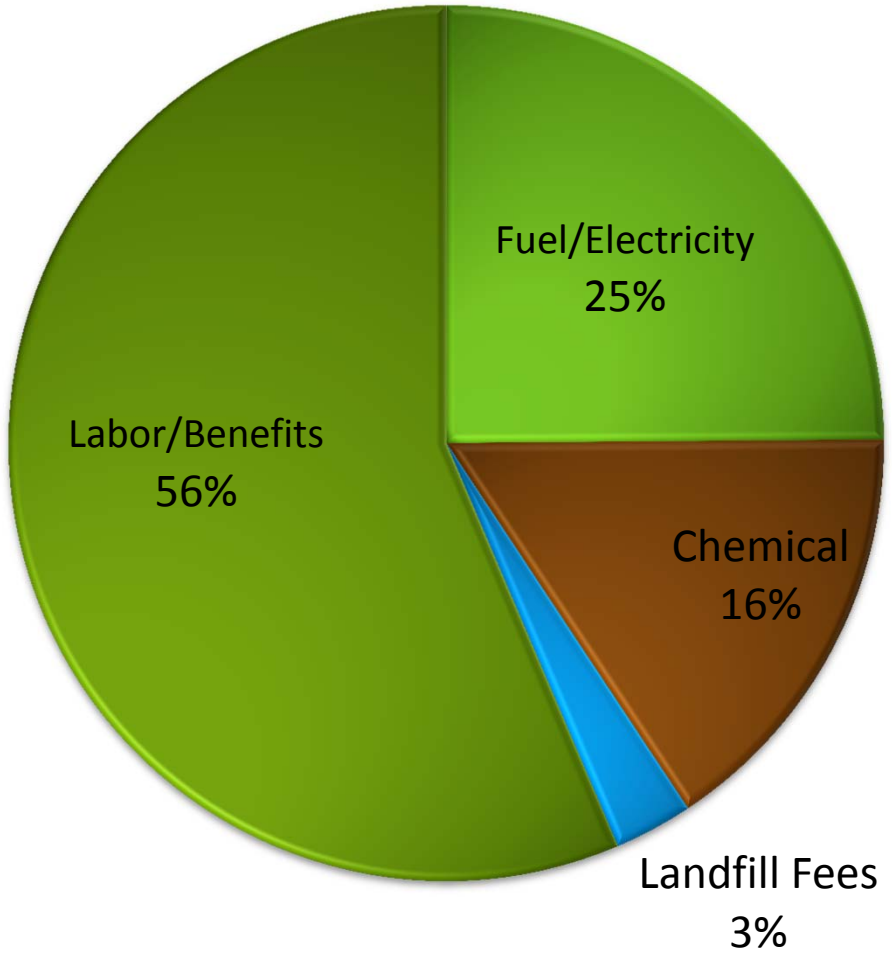
Anaerobic Digestion	• Dewater cake to 20%+ solids
Incinerate Sludge	• Produce inorganic ash, use as landfill cover
Chemical Stabilization	• Dewater cake plus add lime, 25%+ solids
Combination	• Sludge drying • Other methods
Focus of this presentation	• Digestion and Incineration

Solids Handling Operating Costs

Anaerobic Digestion



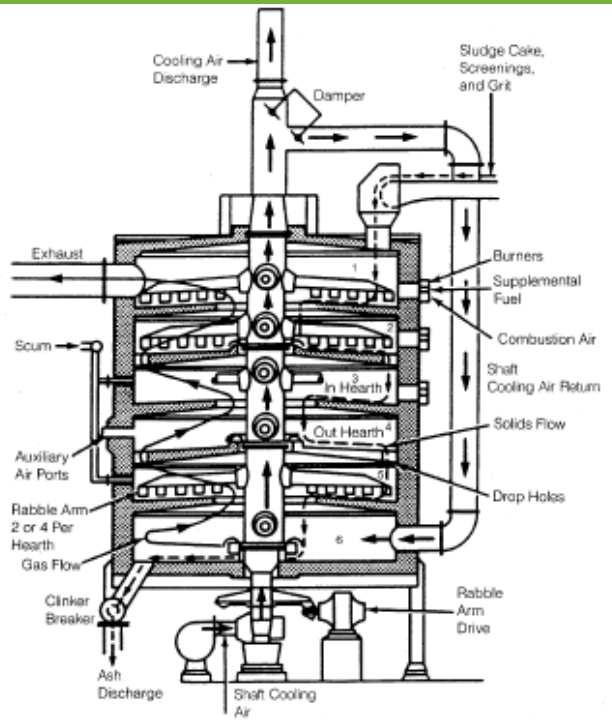
Incineration



INCINERATION

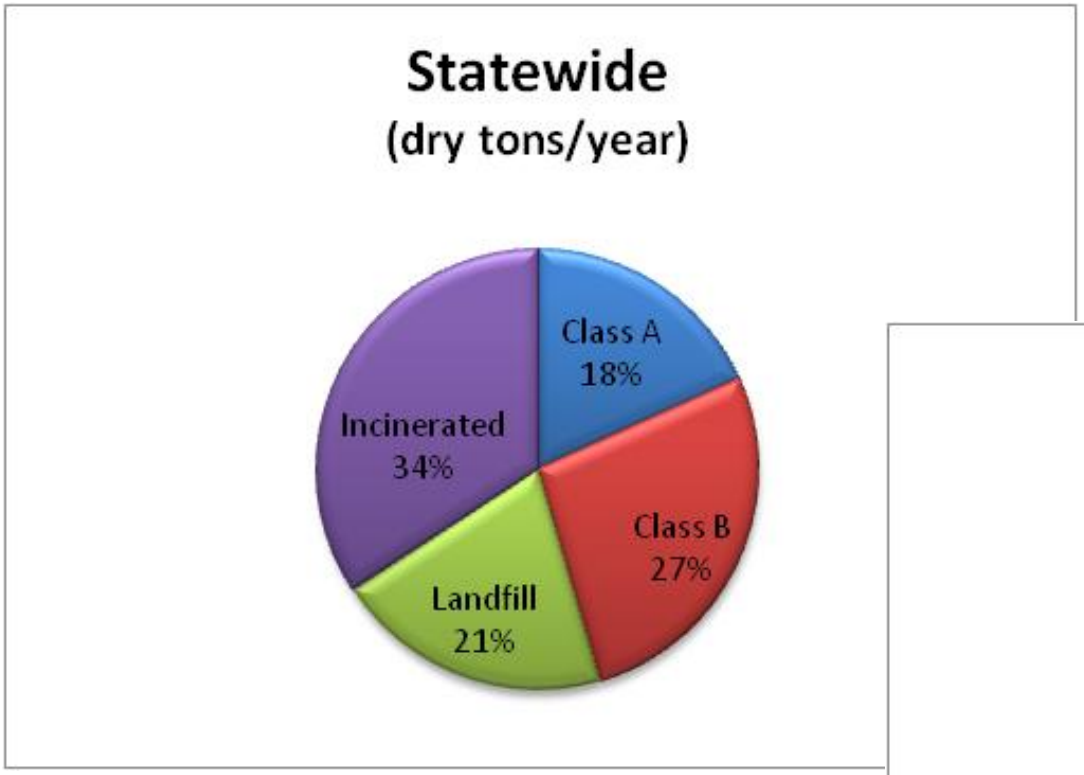
Sewage Sludge Incinerators

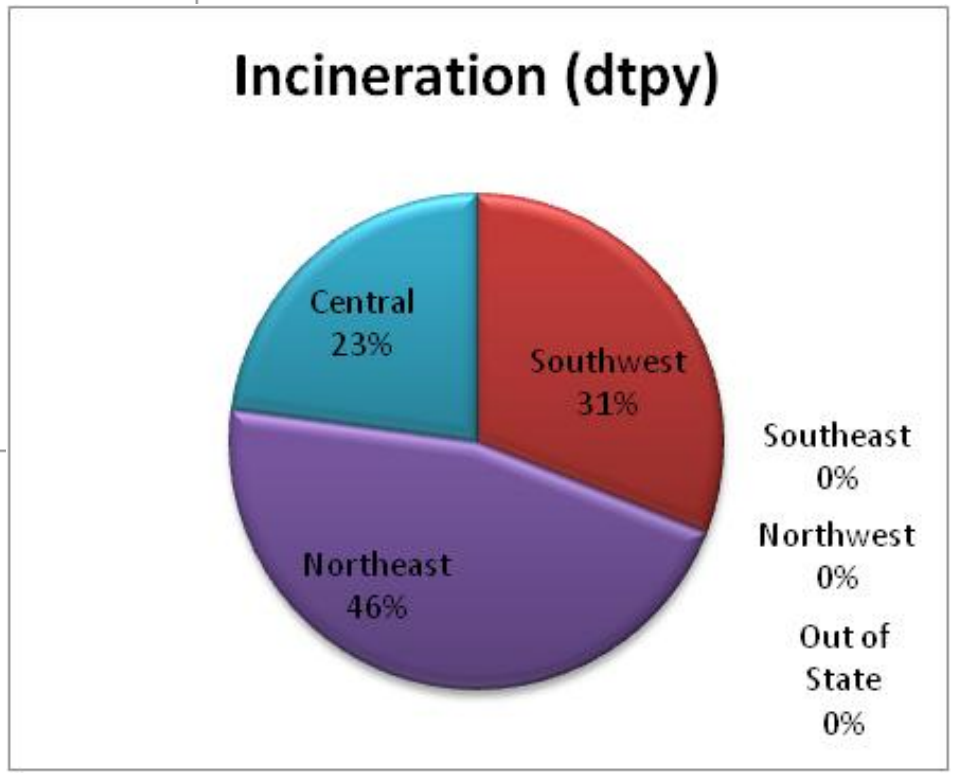
- ~170 SSI plants in operation in US
- Three main types of incinerators are used
  - >80% are of the multiple hearth design
  - ~15 percent are fluidized bed combustors
  - 3 percent are electric
- Most located in the Eastern United States
  - Also a significant number on the West Coast
- New York has the largest number of facilities (33)
- Pennsylvania (21) and Michigan (19) have the next-largest numbers of facilities
- **Ohio has ~10 plants with SSI's**



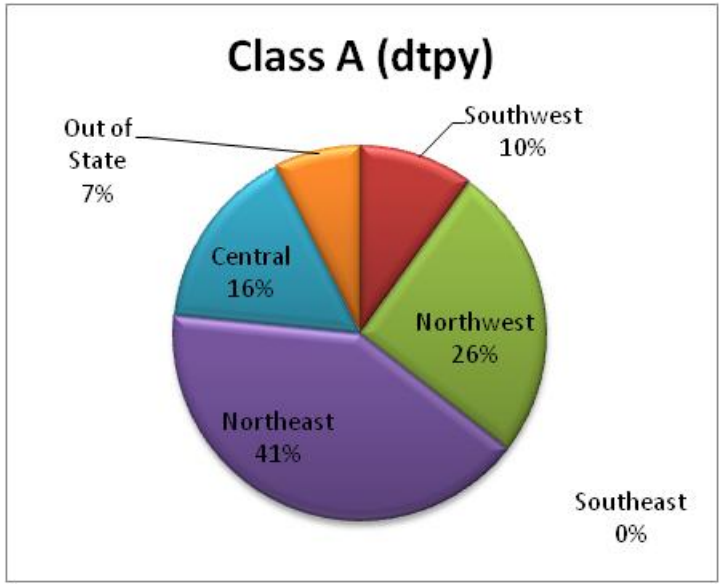
Source: AP-42, *Compilation of Air Pollutant Emission Factors*, EPA, 2012

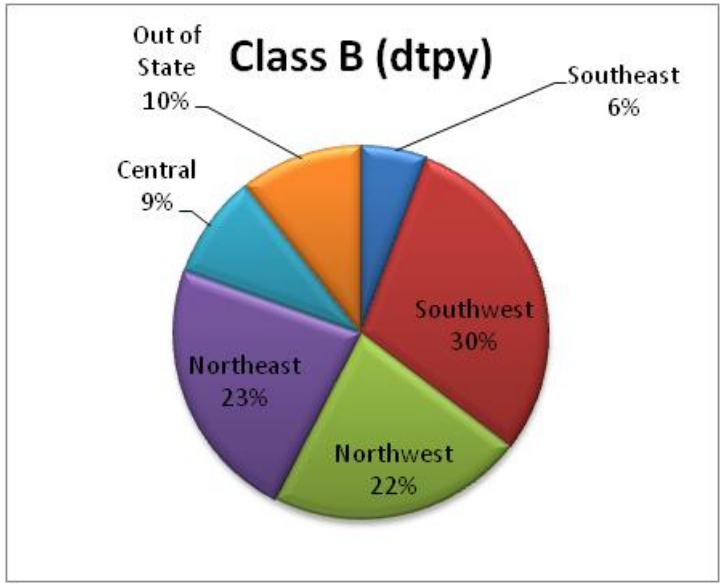
Incineration Practices in Ohio

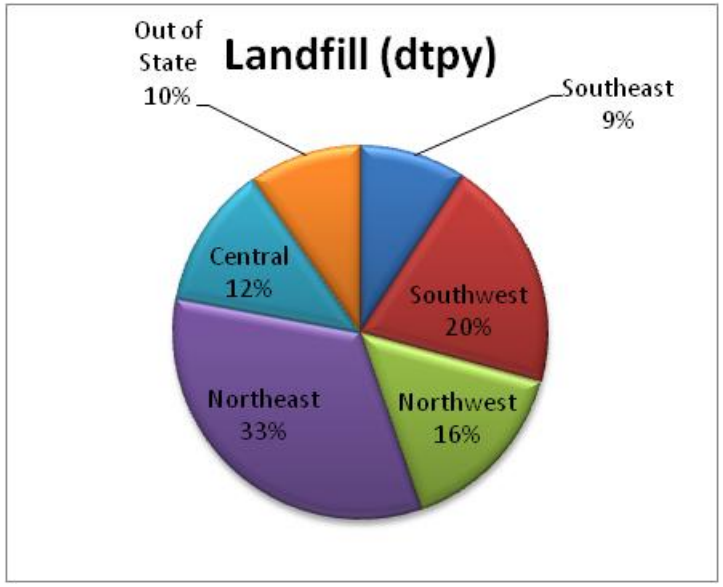




Other Biosolids Practices in Ohio







Maximum Achievable Control Technology (MACT)

- Incineration no longer falls under "domestic sewage exclusion" provision of the Clean Water Act, but under Section 129 of the Clean Air Act
- Compliance date is March 21, 2016
- SSI classification determination is necessary
  - Emissions testing is required
- Additional/New Controls may be required
  - Mercury scrubbing system
  - Caustic addition to wet scrubber venturis
    - Sulfur dioxide compliance and improved HCl emissions
  - Addition of wet electrostatic precipitator
    - Cadmium, lead, and particulates compliance
  - Selective Non Catalytic Reduction system
    - Inject ammonia in exhaust gas exit for NOx reduction

Incineration

Strengths

- Turn on/off as needed
- Ash residual (solids reduction)
- Proven Technology
- Operator familiarity
- Lower initial capital cost

Weaknesses

- More fossil fuel (higher utility cost)
- Larger carbon foot print
- Limited grant potential
- Not "Green"
- Odor from sludge handling
- Higher operation cost
- Limited tipping fee potential

Incineration

Opportunities

Merchant Facility: Accept outside sludge for revenue

Threats

Utilize original/rebuilt incinerators

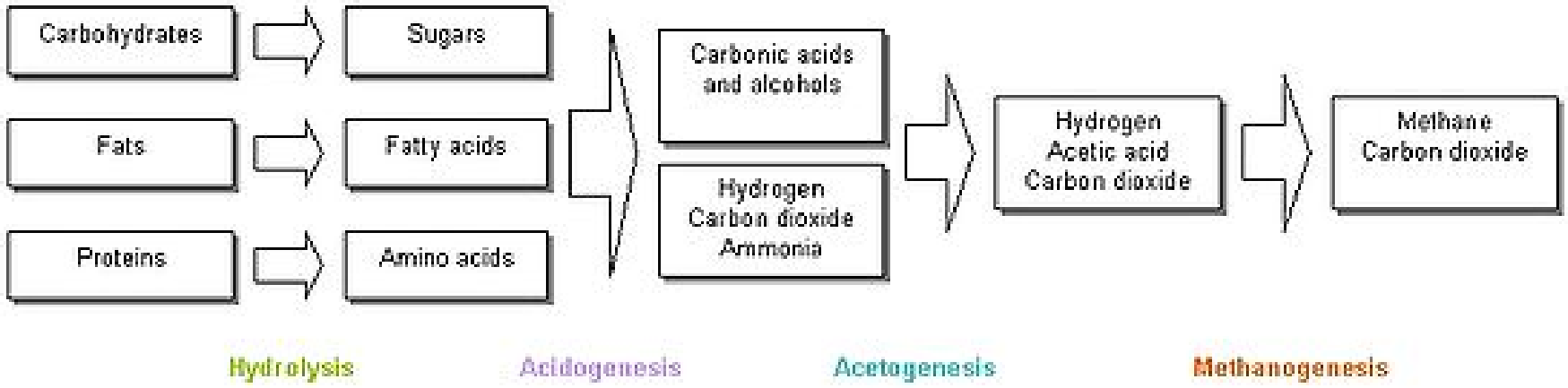
Future cost to replace

Potential changes in air emission regulations

ANAEROBIC DIGESTION

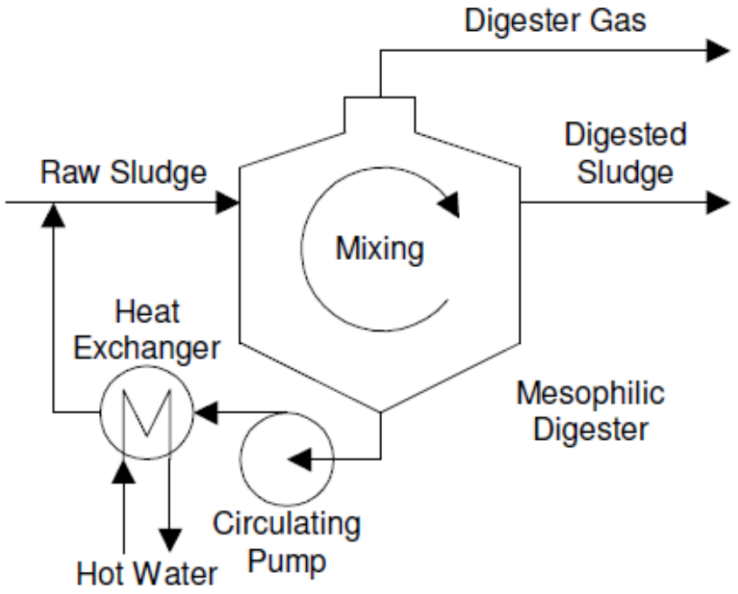
Anaerobic Digestion

- **Primarily for solids stabilization as part of an overall solids handling system**
- **Mesophilic digestion is most prevalent**
  - ***95º to 98ºF (35º to 37ºC)***



Mesophilic Digestion

- **Features of a well-designed and well-operated mesophilic digestion process**
  - **Uniform feed of screened and de-gritted raw solids**
    - **semi-continuous/continuous**
  - **Automatic removal (positive control) of floatables. scum. and foam**
  - **Complete mixing**
  - **Adequate heating**
  - **Improved pre-thickening of feed**



Conventional Mesophilic Anaerobic Digestion

Anaerobic Digestion

Strengths

- "Green"/ sustainable technology
- Reduced carbon footprint
- Tipping fee generation
- Energy recovery
- Proven Technology
- Closed vessel/no odors
- No incinerator stacks
- Grant potential

Weaknesses

- Biological process
- Capital cost
- Operational skill (new skill set/training required)
- Residual sludge/digestate disposal

Anaerobic Digestion

Opportunities

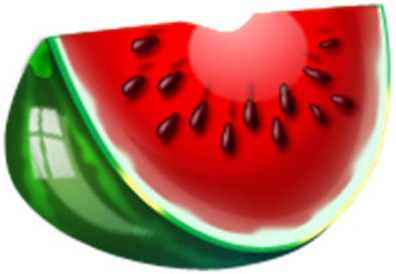
- Grant potential
- Tipping Fees
- Rate stabilization
- Third party performance contracting
- Public Relations - Community Good Neighbor
- Future SSO waste & regulations/compost fee

Threats

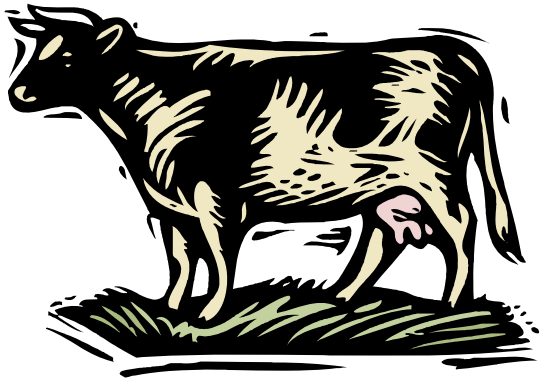
- Sour digester if not property operated
- Odors if not operated properly
- Toxicity
- Overfeed/underfeed/loading
- Market competition for outside sources – new mind set

Digeste YES, Incinerate NO

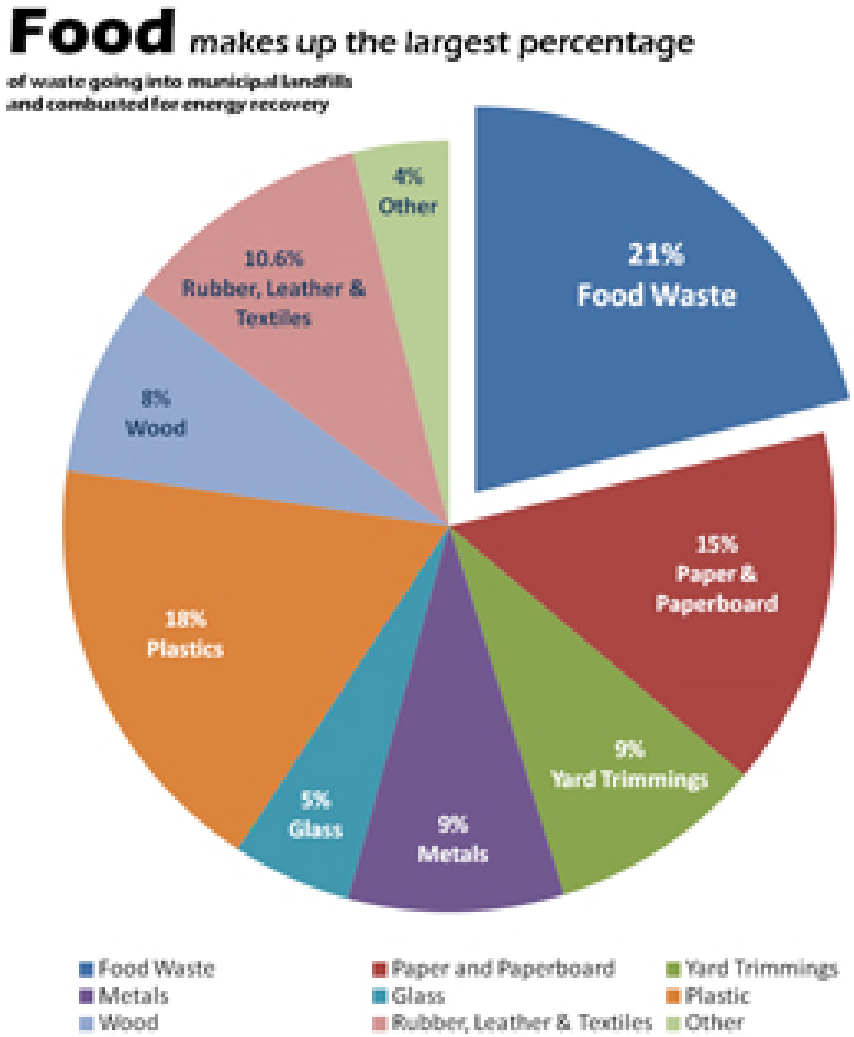
- Dairy whey
- Salad dressing
- Fats, oils, and grease
- Manure
- Outdated beer and soda
- Pulverized food waste



- Small particles, no contamination, no grit



Municipal Solids Waste to Landfill



Future Sludge Management Options

Incineration

- Business as usual
- Uncertain Long Term Solution

Anaerobic Digestion

- New sources of revenue
- Operating cost reduction

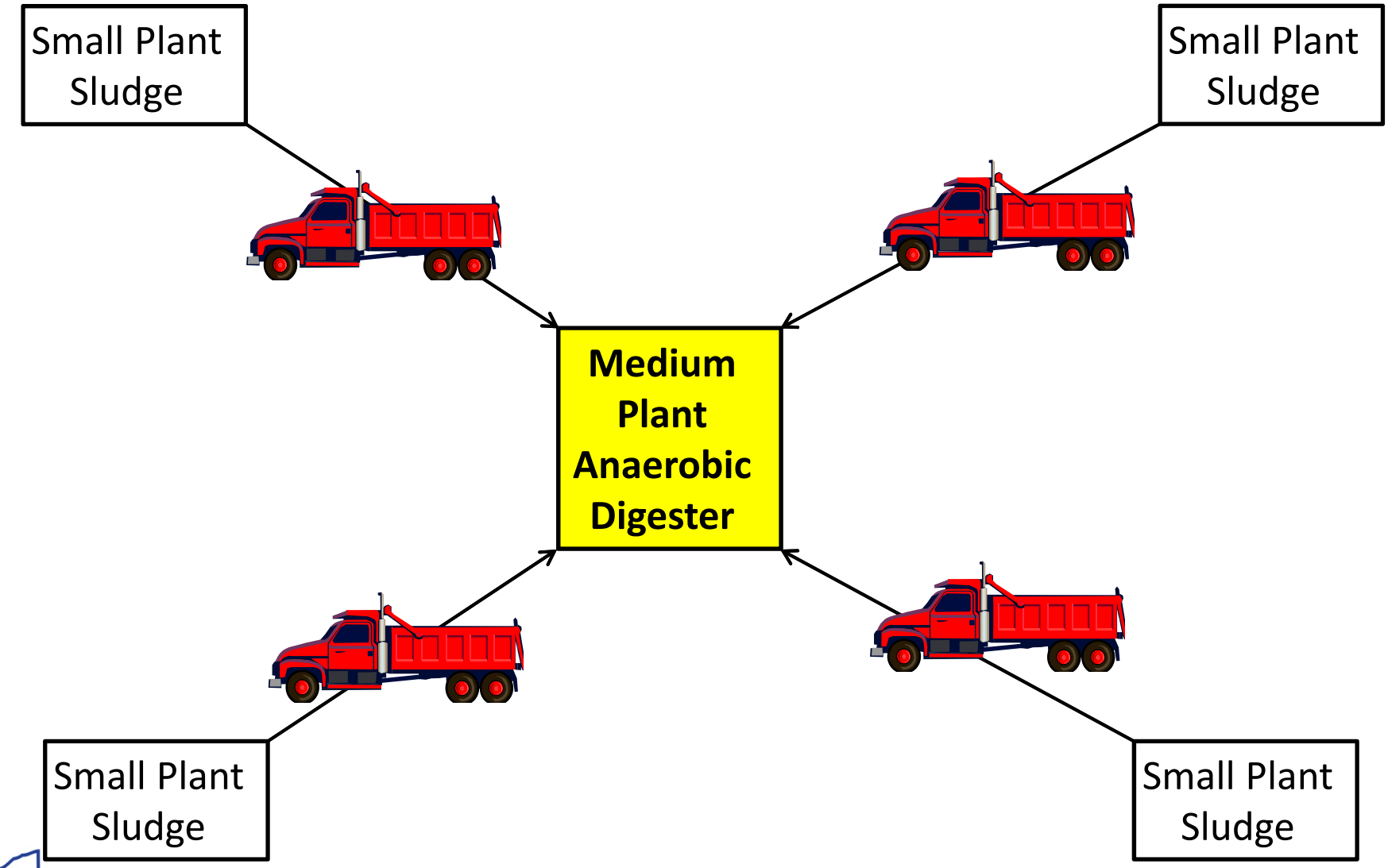
Benefits of Anaerobic Digestion

Anaerobic Digestion	• Good neighbor technology
High Strength Waste	• Can be treated by this technology
Revenue Potential	• Tipping fees
Cost Avoidance	• Electricity purchase

Harvest Carbon or Waste Carbon?

- Sludge
  - 75% VS before digestion
  - 60% VS after digestion
- Anaerobic Digestion
  - Removes some carbon during the 20 day process
  - Converts it to carbon dioxide and methane
- Remaining Carbon
  - Still in the sludge cake
  - Hauled to composting or the landfill
- Incineration
  - Destroys virtually all of the carbon and volatile solids
- Remaining Ash
  - Mostly inert, inorganic material
  - Suitable to be used as daily cover at the landfill

Hub and Spoke



One Size Fits All?

- The decision to digest or incinerate sludge must be done on a case-by-case basis
- Not cost effective to digest or incinerate sludge at small wastewater plants
- Maybe cost effective to digest sludge at medium size facilities, but not cost effective to incinerate
- Possibly cost effective to digest and incinerate sludge at large facilities

QUESTIONS?

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