Class A Biosolids Produced w/ Closed Alkaline Process

Presented by:

ERIC WANSTROM

SCHWING BIOSET, INC.

Overview

- Summary of EPA 503 regulations for Class A systems
- Factors to consider when evaluating Class A systems
- Overview of closed alkaline stabilization Bioset process
- How four cities chose their Class A process
- Land application practices

How Do I Achieve Class A?

EPA United States Environmental Protection Agency

Environmental Regulations and Technology

Control of Pathogens and Vector Attraction in Sewage Sludge

503 Regs define three areas:

- Pathogen Reduction
  - Several options
- Vector Attraction Reduction
  - Several options
- Metal Limits

SCHWING BIOSET

How Do I Achieve Class A?

Pathogen Reduction:

- Time/Temp formula
- pH adjustment
- Thermal Drying
- Composting
- Thermophilic Digestion
- Beta Ray Irradiation
- Gamma Ray Irradiation
- Pasteurization

How Do I Achieve Class A?

Vector Attraction Reduction:

- Volatile solid reduction
- SOUR reduction
- Aerobic digestion
- pH adjustment
- Increased DS content

How Do I Achieve Class A?

Metal Limits:

- Class A technologies do not remove them

- Only dilute or concentrate depending on process

How Do I Achieve Class A?

If you meet the Vector & Pathogen requirements:

= Class A

If you meet Vector, Pathogen & Metal requirements:

= Class A EQ (exceptional quality)

Common Ways to Achieve Class A

Composting

Thermal Drying

SCHWING BIOSET

Common Ways to Achieve Class A

Digestion

Alkaline Stab.

So many options. How do I Choose?

Capital Costs

- -Class A equipment costs
- -Required ancillary equipment costs
  - (ex: odor control, fire suppression, machinery)
- -Reuse existing buildings & tanks or build new

Operating Costs

- -Fuels
- -Power
- -Chemicals
- -Odor control
- -Additional staff
- -New plant operating hours

SCHWING BIOSET

So many options. How do I Choose?

Reliability

- Down Time
- Costs to handle sub-Class A material
- Spare Parts

Ease of Operation

-Additional personnel required
-Additional shifts
-Additional/Specialized training

So many options. How do I Choose?

Complexity / Safety

- -Specialized training / certification?
- -What happens during upset conditions?
- -Plant staff repair or is original Manufacturer needed?

Odors or other side streams

- -Off gases to scrub?
- -Liquid streams to treat in plant?

So many options. How do I Choose?

Required space

-Will it fit in my existing structures or do I need a new building?

Does end product look different?

-For marketing, perception is 90% of battle

-If biosolids still look like Class B- hard time with public perception that your Class A is better

But the most important factor….

SCHWING BIOSET

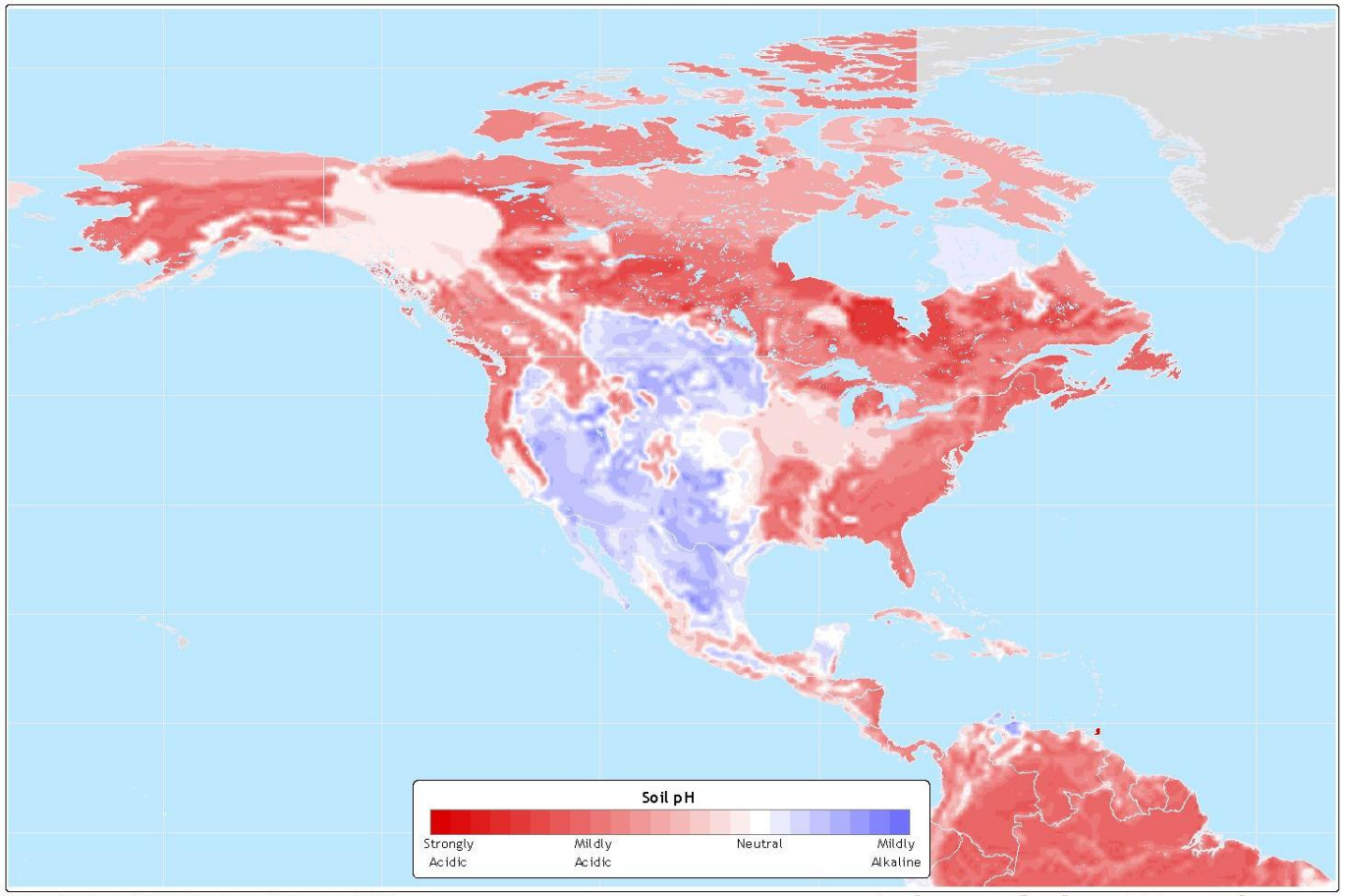
But the most important factor…

What can I market in my area?

- Maybe you did a study and settled on the best technology based on all the criteria from the previous slides.
- Great, but if the end product cannot be used by local agriculture, cement kilns, etc., then you are still destined to be paying to take your Class A biosolids to a landfill.
- You spent the money to study Class A technologies
- You spent the money for the Class A equipment
- But now are no better off than when you were making Class B.
- If you have a market, the volume produced is generally irrelevant

SCHWING BIOSET

Soil Alkalinity Map of North America



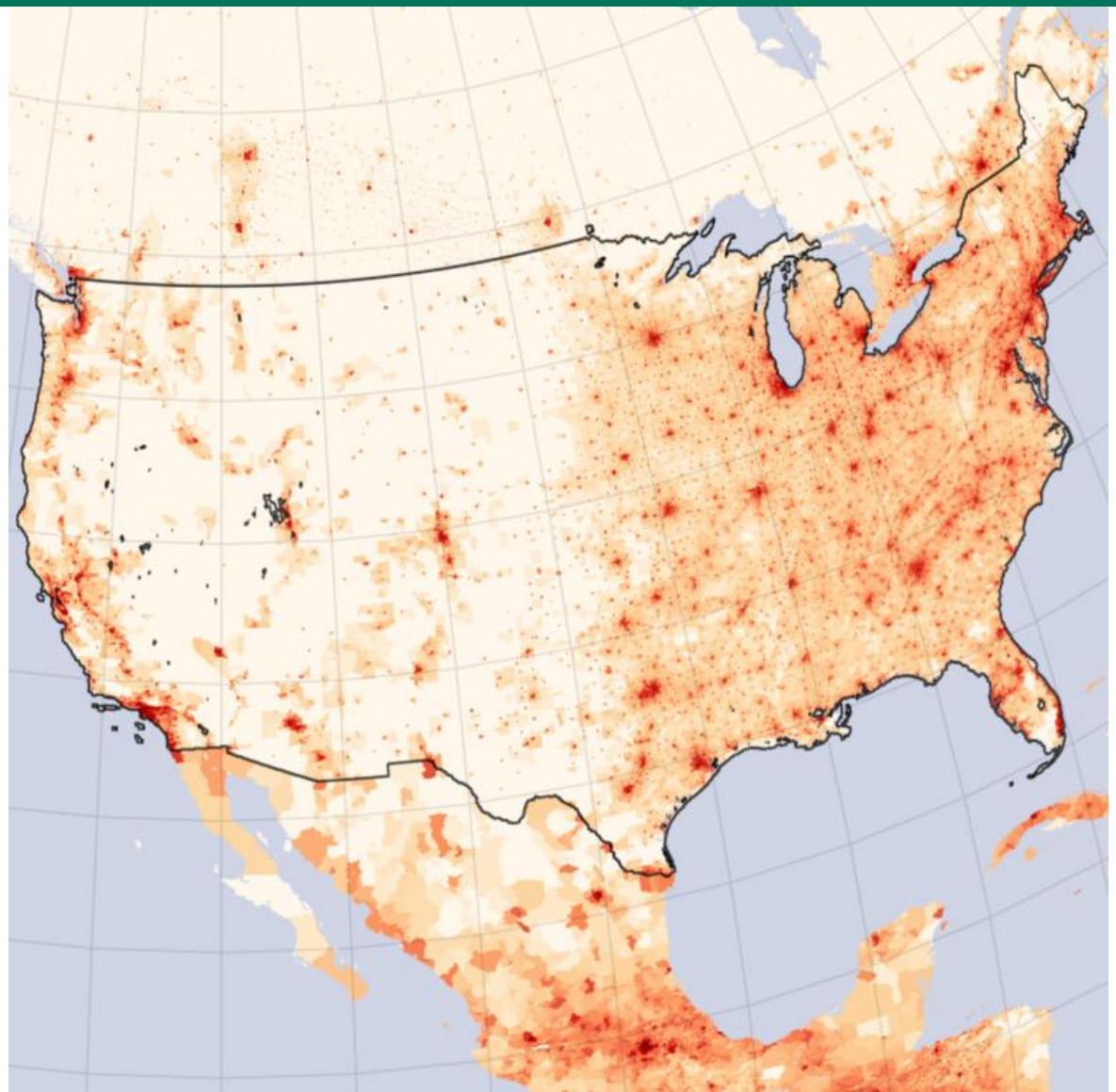
Data taken from: IGBP-DIS Global Soils Dataset (1998)

Atlas of the Biosphere

Center for Sustainability and the Global Environment
University of Wisconsin - Madison

SCHWING BIOSET

Where are all the people in the USA?



Alkaline Stabilization

Pros:

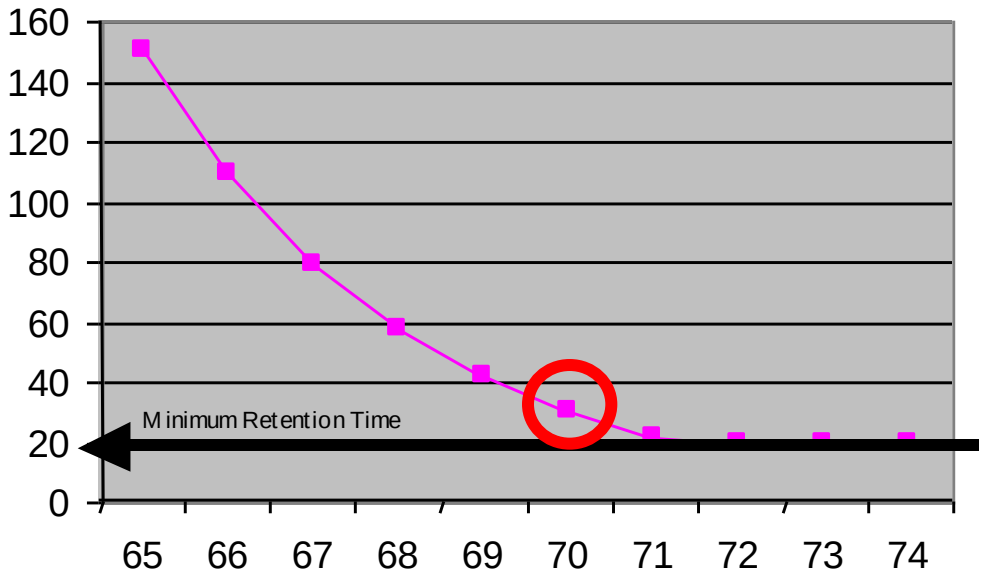
- Biosolids “look” different
- Inexpensive to buy
- Inexpensive to operate
- Class A is a sought after fertilizer in areas with low pH soils
- Small footprint
- Easy to operate & maintain

Alkaline Stabilization

Cons:

- Can be dusty
- Can be odorous
- Homogeneous mixing can be an issue

How do Closed Advanced Alkaline Stabilization Processes Achieve Class A?



Pathogen reduction achieved by Time vs Temp:

503.32(1)(A) When the percent solids of the sewage sludge is seven percent or higher, ….. and the temperature and time period shall be determined using equation (1), except when small particles of sewage sludge are heated by either warmed gases or an immiscible liquid.

$D = 131{,}700{,}000 / 10^{0.1400t}$

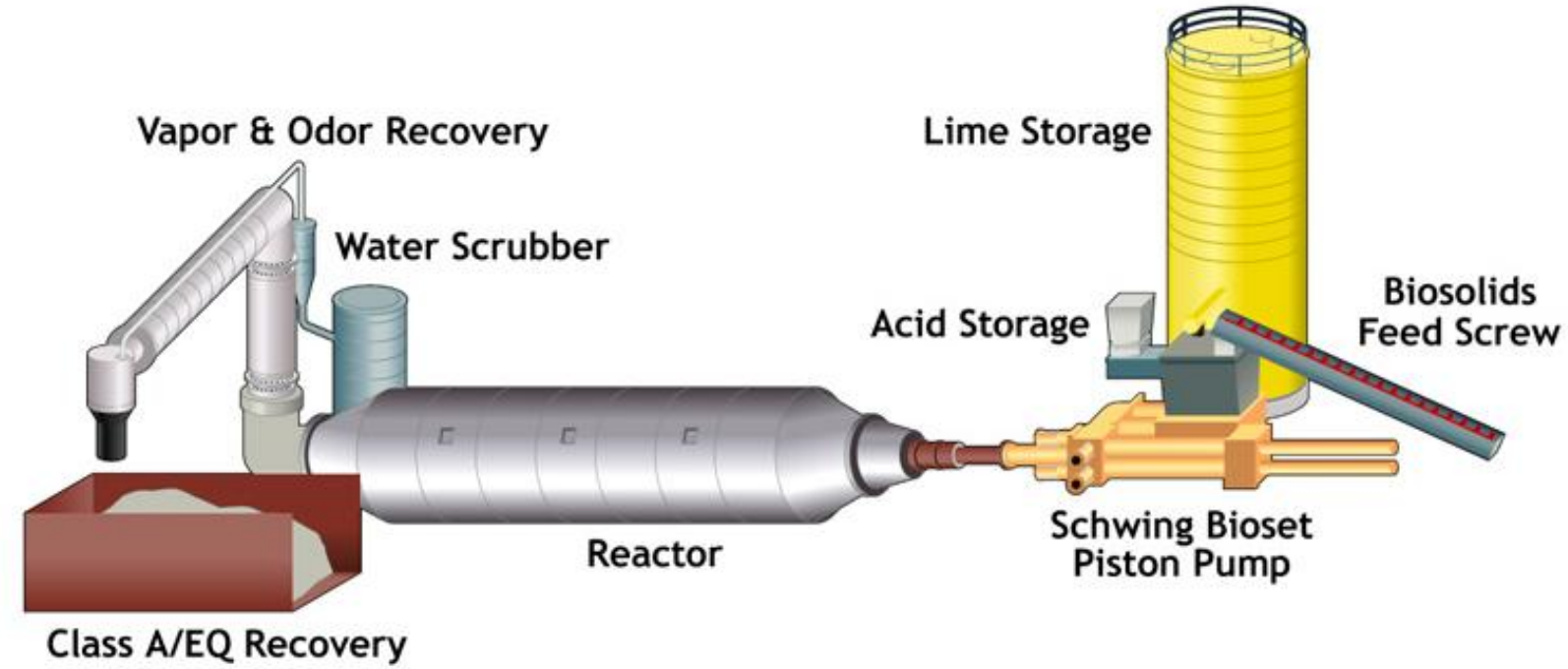
How do Closed Advanced Alkaline Stabilization Processes Achieve Class A?

Vector attraction reduction achieved by elevated pH

- *503.33(b)(6) The pH of the sewage sludge shall be raised to 12 or higher by alkali addition and without the addition of more alkali, shall remain at 12 or higher for 2 hours and then 11.5 or higher for an additional 22 hours*

Alkaline Stabilization in a Closed Process

The BIOSET™ Process



Advantages of “Closed” Systems

-Clean Process

-Dust Control

-Odor Control

-Ammonia Kill

Twin screw mixing

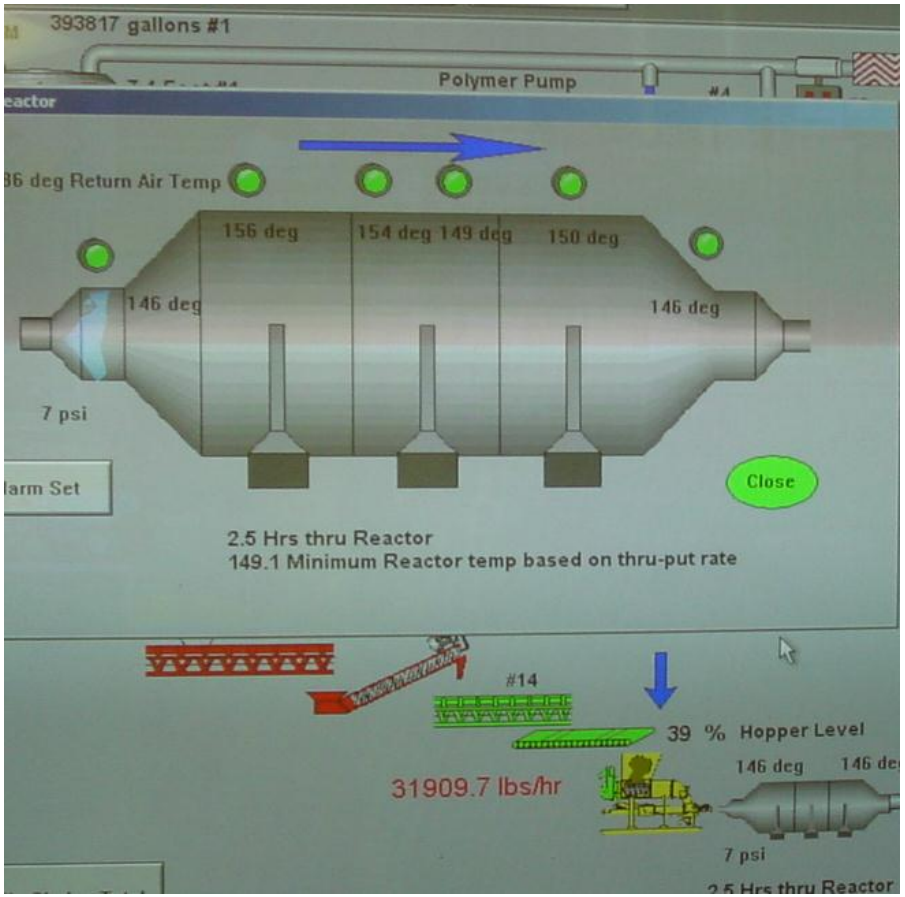
-Self cleaning intermeshing flights

-Paddles for efficient mixing

-Full flights for efficient pump feed

Closed process

The Bioset™ Process



-Temperature probes track material through reactor

-Any off spec material is easily diverted with swivel discharge

-Chemical dosage rates adjust based on reactor temperatures

SCHWING BIOSET

The Bioset™ Process

Because the generated ammonia stays in contact with the Biosolids through process, the ammonia kills pathogens before temperature does.

SCHWING BIOSET

Putting Ammonia to Work in Closed Systems

What does this even mean?

-Pathogen kills are achieved at 55C (rather than 70C)

-Chemical usage can be reduced by approx 30%

(huge reduction in operating costs)

-PFRP approval granted on Aug 16, 2011 on nationwide basis

SCHWING BIOSET

“Open” Alkaline Stabilization Systems

- Incomplete mixing leaves un-reacted lime & untreated biosolids

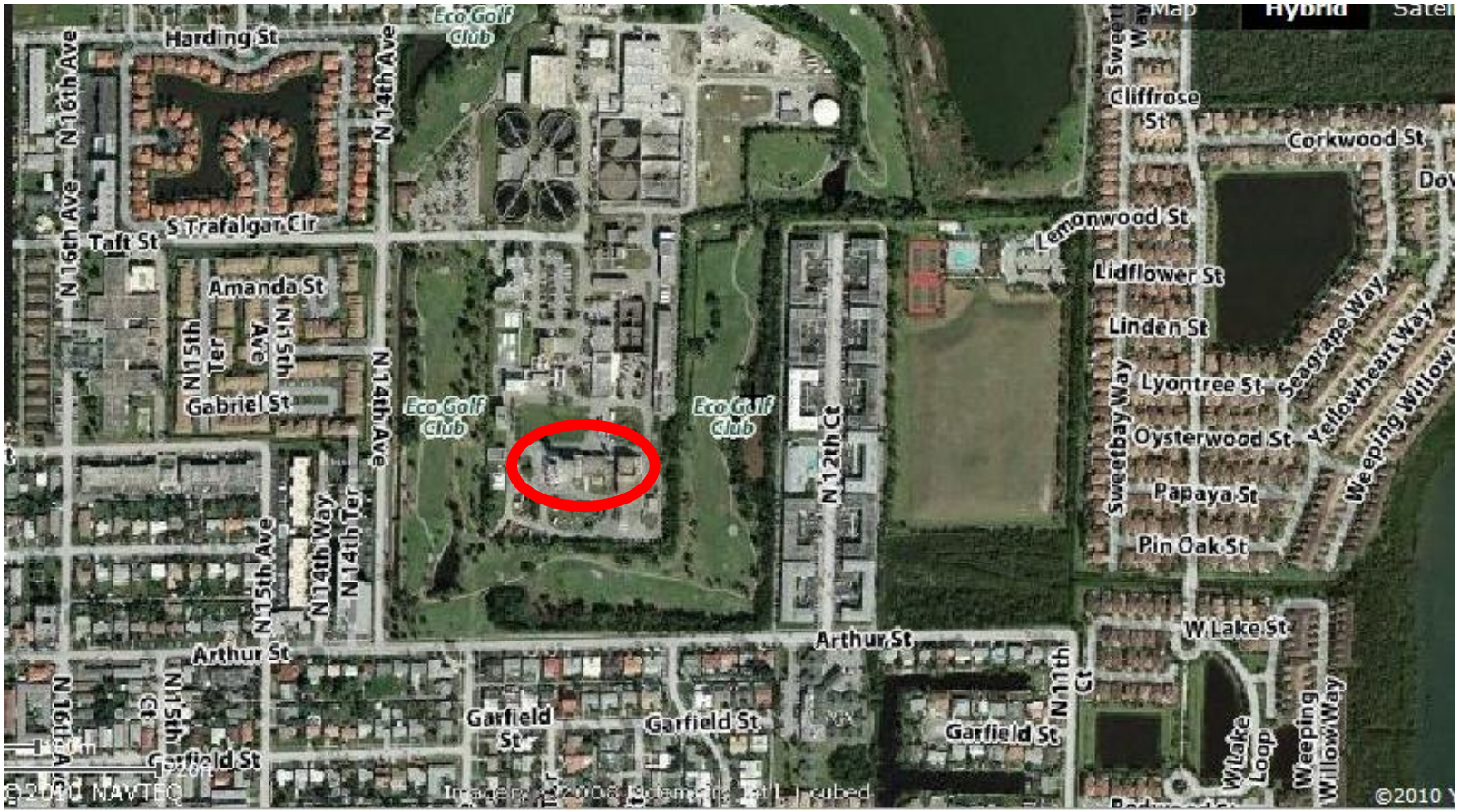
- Ammonia odor uncontained

SCHWING BIOSET

“Open” Alkaline Stabilization Systems

- Excessive dust emissions
- Some require additional external heating to complete time/temp exposure

Southern Regional WWTP; Hollywood, FL



- 50 MGD facility

- Suffered from frequent odor complaints

SCHWING BIOSET

Hollywood, FL Legacy Installation

- Abandoned previous open alkaline Class A system
- Experiencing raised tipping fees at landfill
- New regs banning Class B disposal in Lake Okeechobee watershed

Hollywood, FL Bioset Installation

- RFP solicited in Design-Build-Market format
- Received two alk. stab. based proposals – “open” & “closed”
  - selected the closed Bioset process

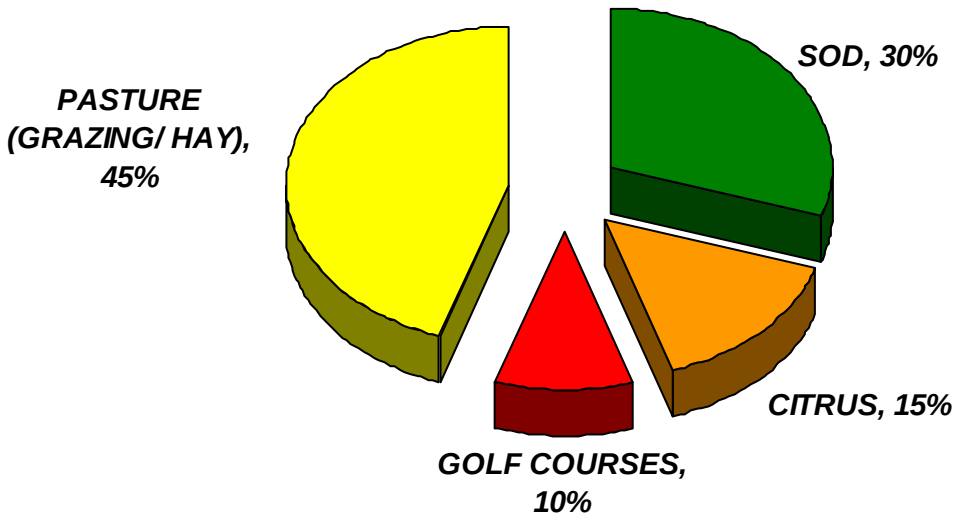
SCHWING BIOSET

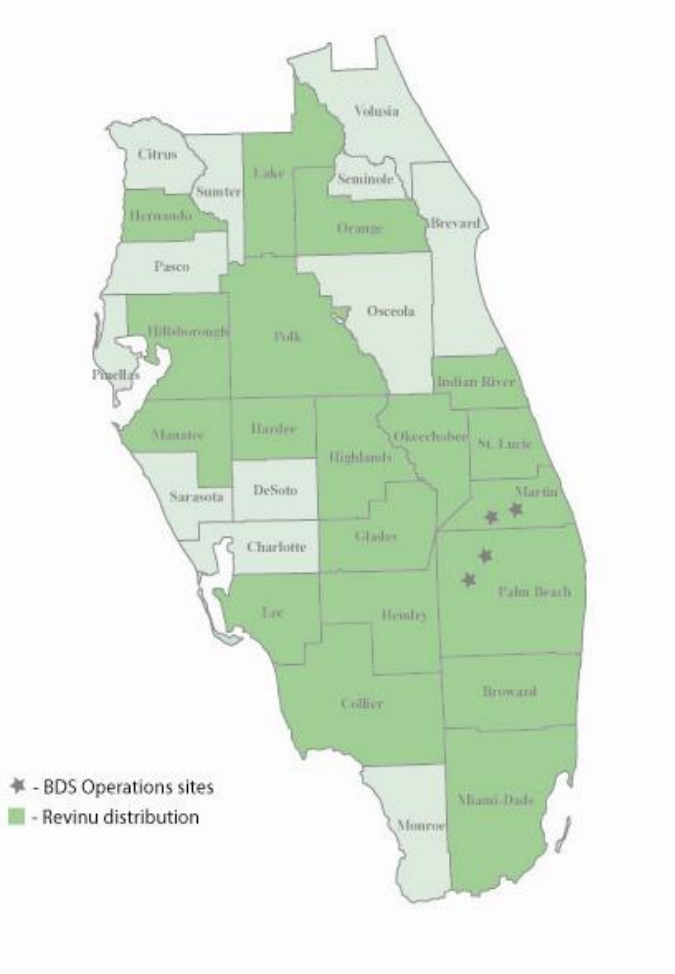
Hollywood, FL Bioset Installation

Key Selection Factors:

- Met new FL regulations
- Odor control
- Dust Control
- Efficient Mixing
- Reliability
- Redundant system
- Marketable product

Hollywood, FL Bioset Marketing





- Have marketed over 300,000 wet tons of Class A EQ Biosolids since 2005.
- Approx 120 wet tons per day

SCHWING BIOSET

Hollywood, FL Bioset Marketing

State of Florida
Department of Agriculture and Consumer Services

FERTILIZER LICENSE

Chapter 576, FLORIDA STATUTES
BIOSOLIDS DISTRIBUTION SERVICES
39347 FLINK AVE
NORTH BRANCH, MN 55056
License No. F1686

This is to certify that the person whose name and address are shown above, has paid the required fee of $200.00 and is hereby granted this license to distribute fertilizer in the State of Florida as defined in Section 576.021(1), F.S. This license will expire June 30, 2010.

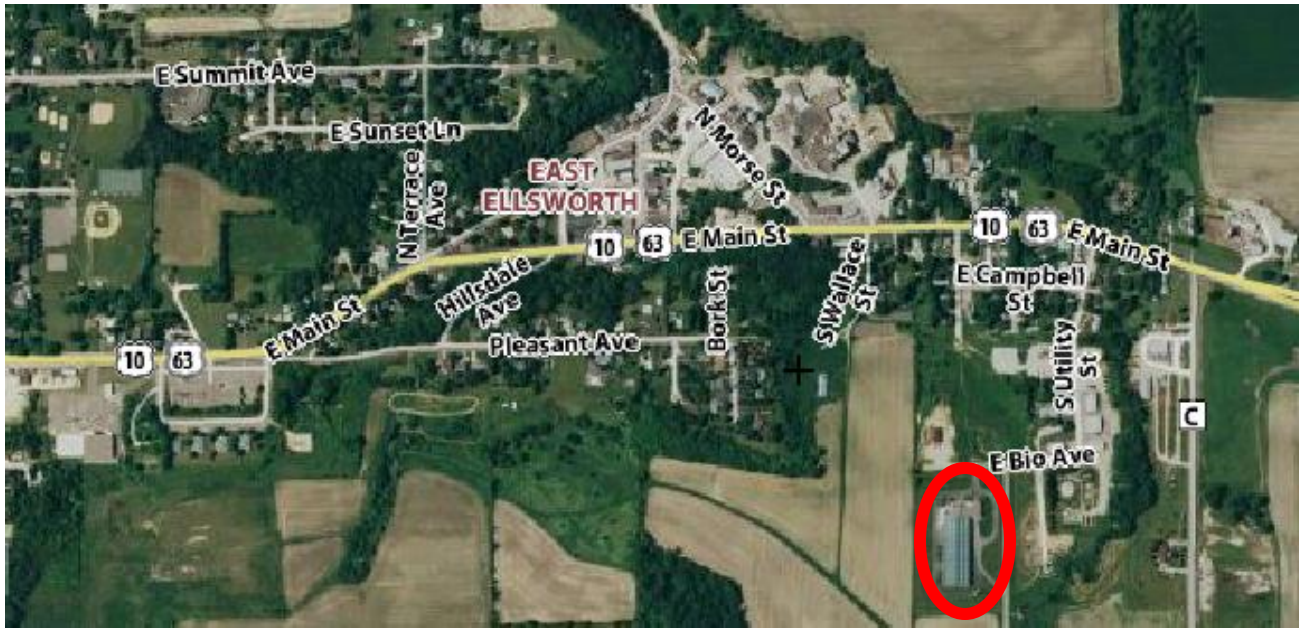
Charles H. Bronson
CHARLES H. BRONSON
Commissioner

Florida

- Bioset Class A EQ is certified fertilizer by FLDEP
- Class A pricing tracks local fertilizer costs: up to $50/ton!
- Have wait lists – can't generate enough to satisfy market

SCHWING BIOSET

West Central Wisconsin Biosolids Facility; Ellsworth, WI



- 7.0 MGD regional facility
- Receives liquid sludge from 22 communities – 1,925 dry tons in ‘09
- Perfect water balance - are not connected to a wastewater plant

SCHWING BIOSET

Ellsworth, WI Legacy Installation

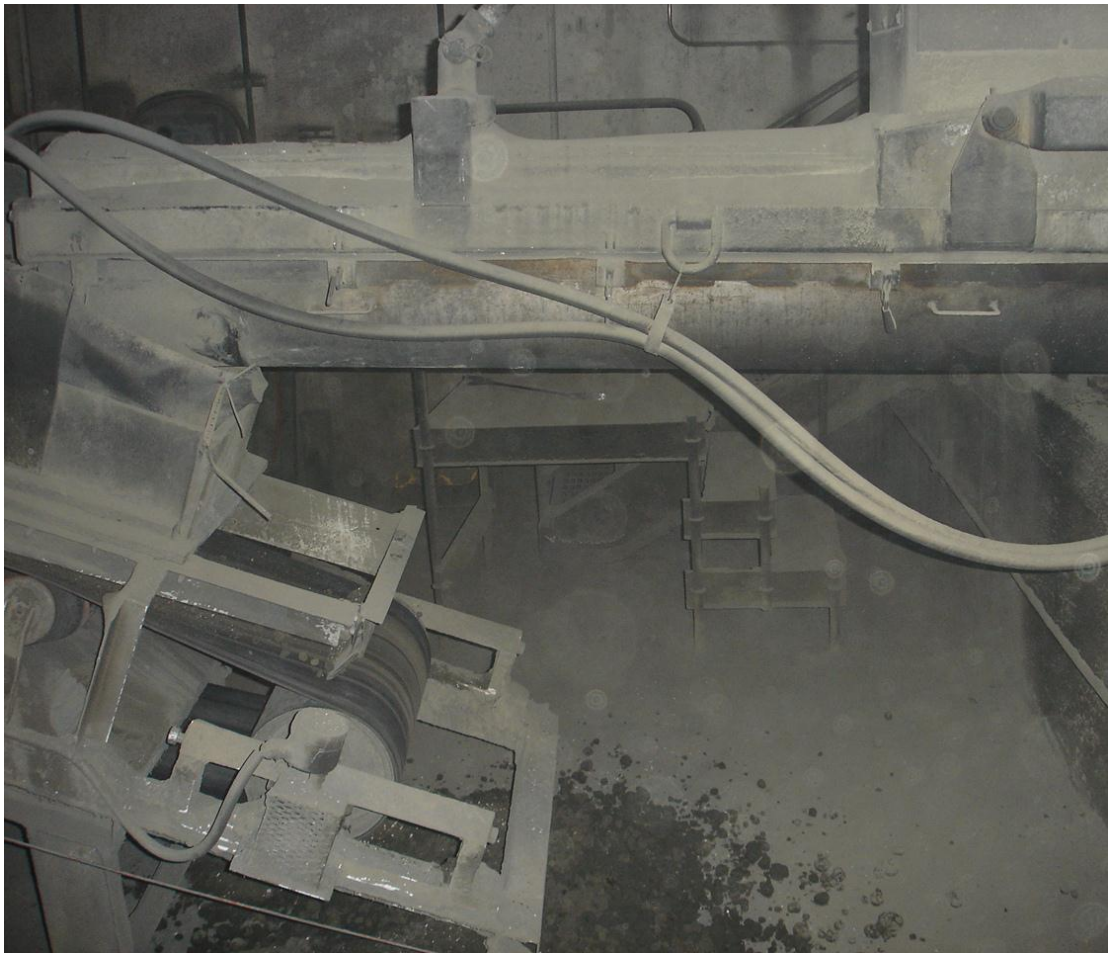
- Facility opened in 1996
- Avg 22 - 24% cake from centrifuges
- Land apply 2 times per year
- Had an “open” alkaline stabilization process

Ellsworth, WI Legacy Installation

Original equip plagued by:

- High maintenance
- Dust generation
- Odors

Ellsworth, WI Legacy Installation



- Incomplete mixing
- Dirty
- Unreacted lime

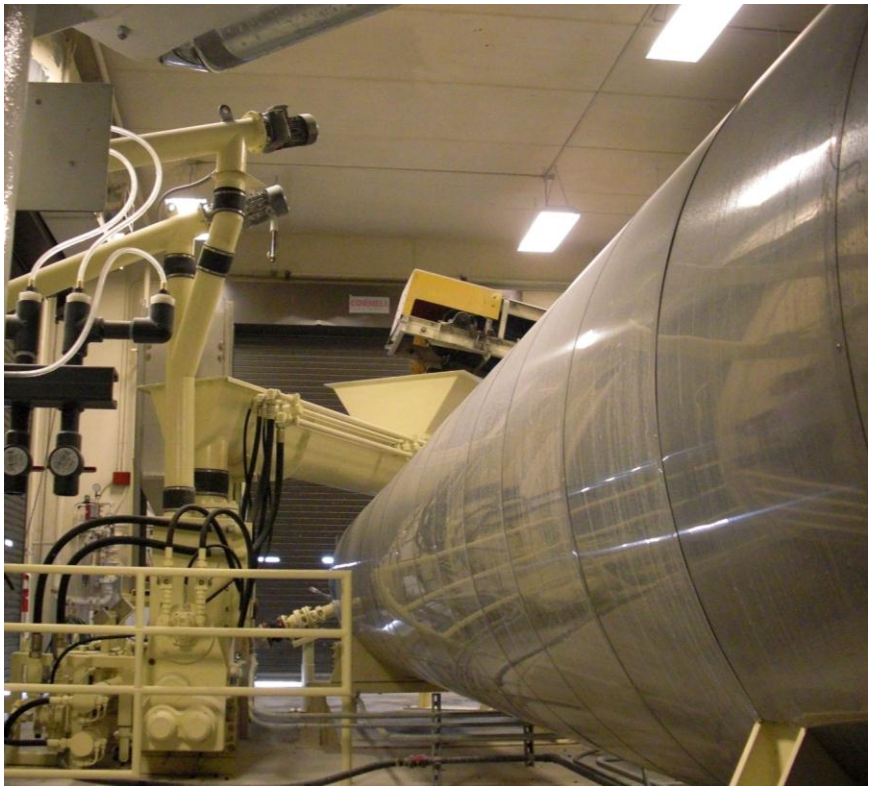
Ellsworth, WI Legacy Installation

- RFP solicted Design-Build proposals

- Bioset selected for many of same reasons as Hollywood:
  - Dust & odor control
  - Simplicity of operations
  - Value of end material
  - Minimal maintenance
  - Reliability

Ellsworth, WI Bioset Installation

Before



After

- Contract stipulated installation to be completed in 7 days

Ellsworth, WI Bioset Installation

Before

After

- Compact design fit into 25’ x 45’ mixing room

Ellsworth, WI Bioset Installation

- Less than 1/2 volume of previous technology.

- Nov. ‘10 completed 2 years operation & spent $0 on spare parts

SCHWING BIOSET

Ellsworth, WI Bioset Installation

- Were paying $6.50/ton to have biosolids hauled & spread
- They now sell Bioset Class A material for $0.25 per ton

Greenway WWTP; London, ON

- 57 MGD incineration facility
- Odors were a big concern
- Centrifuges produce 21 – 24% cake solids

London, ON

- Incinerator in need of repairs

- Investigating what to do with sludge during outage

- 3 month outage would require $42/tonne tipping fee at landfill for Class B.

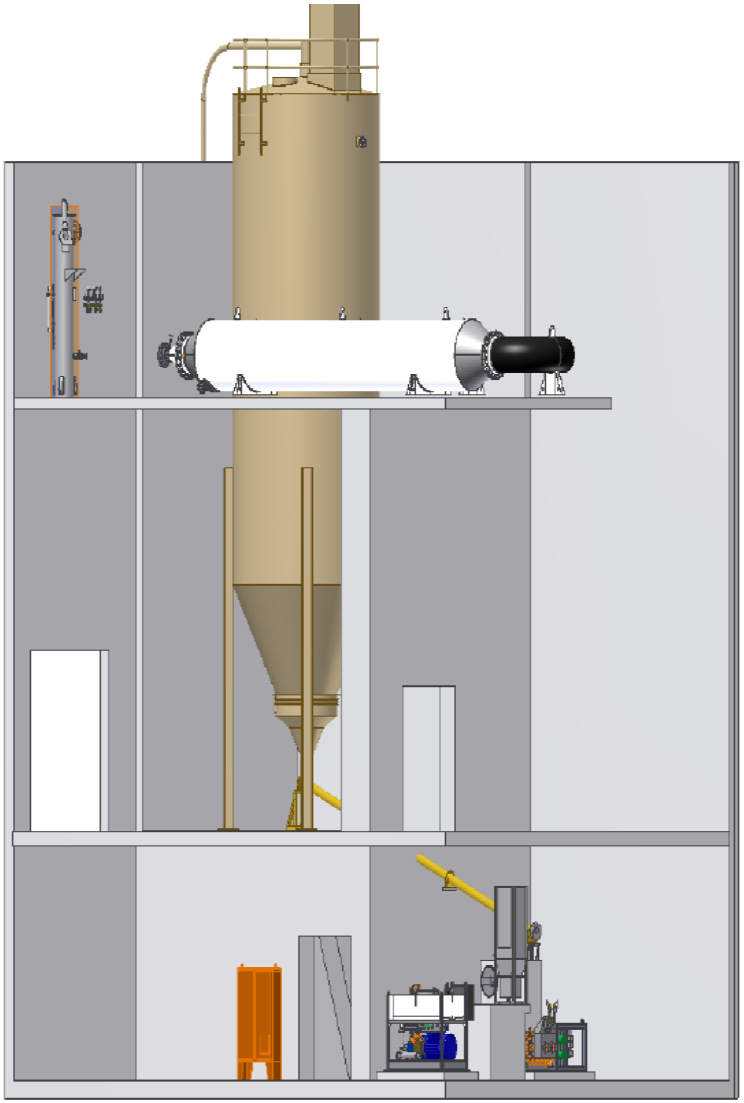
London, ON

- Project was implemented in winter and on a temporary basis so the city did not want to invest in a storage site and marketing for a land application program

- If material would be accepted by landfill as daily cover ($6/tonne), offset in tipping fees would pay for project.

- WWTP and Landfill personnel toured Bioset facilities & land application sites analyzing end product and determined it was acceptable as daily cover.

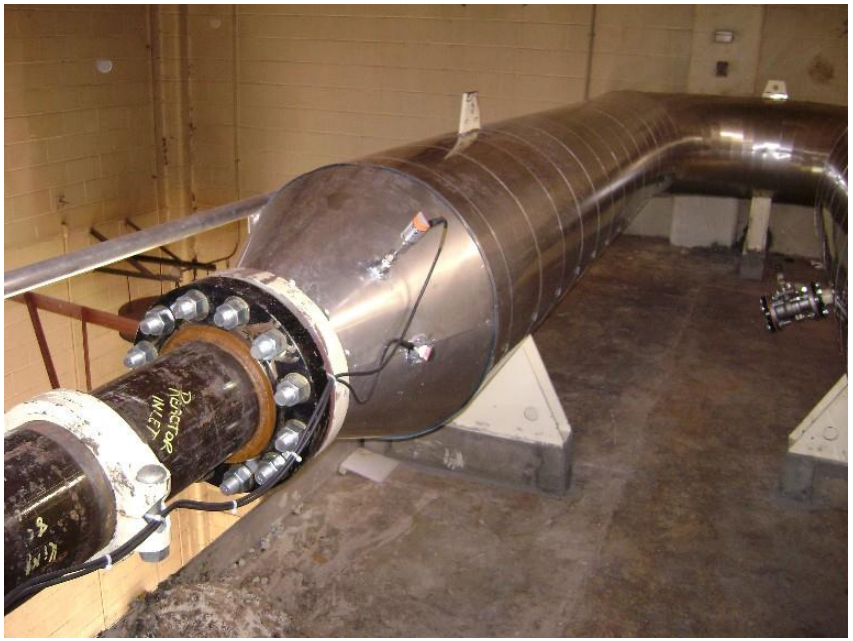
London, ON



- Component equipment permitted flexibility in the layout design.

- No new structures were required to accommodate the new installation.

London, ON

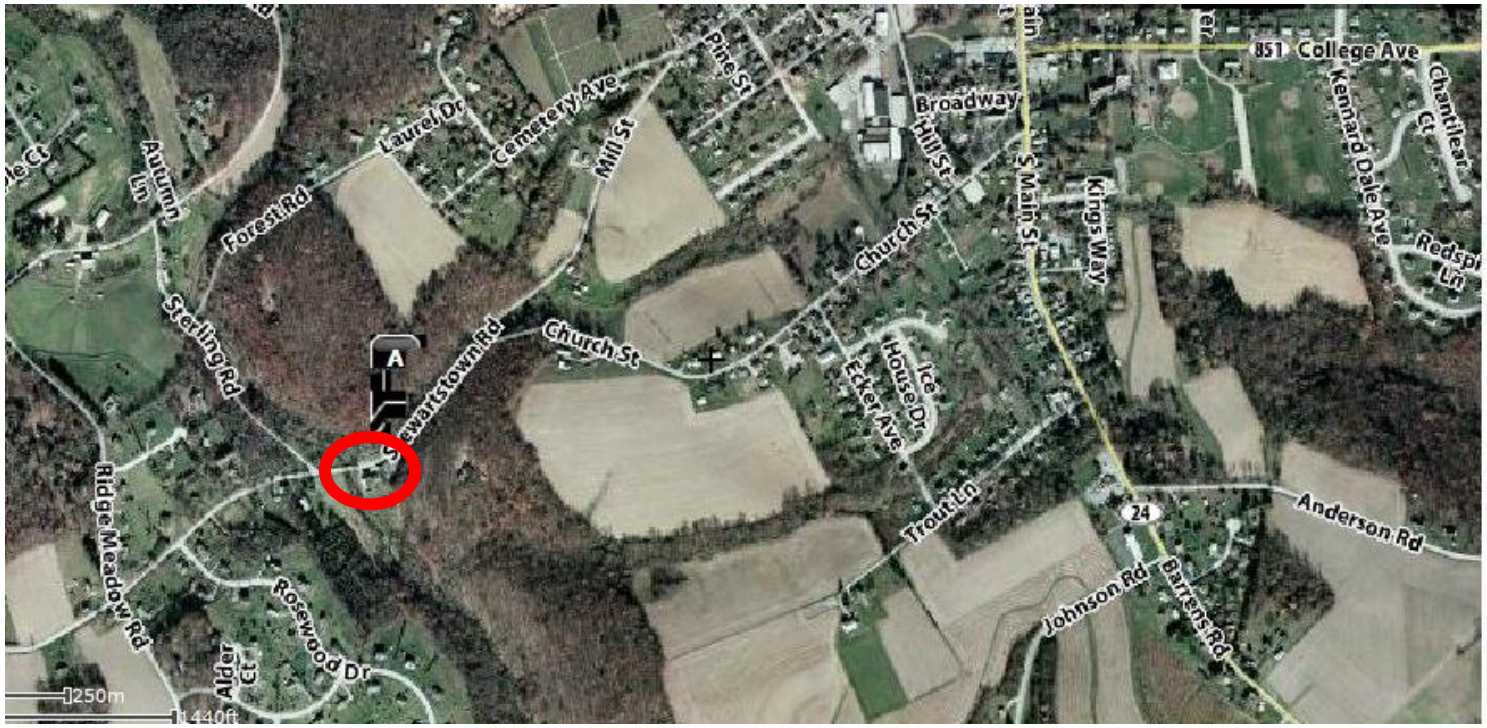


- Lower processing temperature (55C) allowed lower operating costs and still produced pathogen-free landfill cover

- Processed 25,000 Metric Tons between Sept and Dec ‘08

SCHWING BIOSET

Biosolids Facility; Stewartstown, PA



- 0.625 MGD Facility
- In Chesapeake Bay watershed
- City has initiative to *"Go Green"*.

SCHWING BIOSET

Stewartstown, PA

- Serve population of less than 2,000 residents

- Borough considered Thermophilic Digestion – Rejected due to cost and high manpower requirements for small plant

Stewartstown, PA

- Belt Filter Press produces 16% cake
- Compact equipment set was needed to fit into existing center loading bay
- Landfill tipping fees had increased from $50/ton to $60/ton

Stewartstown, PA

- Belt press on Second Floor – feeds screw conveyor that drops into Bioset system on 1st floor.

Stewartstown, PA Bioset Installation

- “Closed” compact system engineered to fit into single garage bay and discharge to waiting truck in adjoining bay.

Stewartstown, PA Bioset Installation

- Storage in a pole barn to keep rain and snow off
- No odor or vector issues
- 2009 generated 372 wet tons of Class A material

Stewartstown, PA Bioset Installation

- 2010 will exceed 400 wet tons
- Material is delivered to local farmers who take all they can produce and the Farmers are responsible for spreading

Columbus, NE

- 3.5 MGD
- Outdoor storage on edge of town

Beneficial re-use of Bioset Class A EQ

- End product is approximately 18% drier than going in
- Can be land applied as discharged or easily air dried further

Beneficial re-use of Bioset Class A EQ

Due to a pH > 11.5, Revinu has the same effects on soil conditioning and pH adjustment as any other liming product on the market.

Beneficial re-use of Bioset Class A EQ

The reaction time on commercial limestone products is around 60 days; because of the form of calcium in the Bioset Class A material (calcium hydroxide) the reaction time is less than 15 days.

Beneficial re-use of Bioset Class A EQ

Guaranteed NPK analysis for Florida is
2.0 - 0.35 - 0.40

Total Nitrogen (N)……...2.0%
0.87 % Water Soluble Nitrogen
1.13 % Water Insoluble Nitrogen
Available Phosphate (P205)…….0.35%
Soluble Potash (K20)……....0.40%
Calcium (Ca)……10.00%
Calcium Hydroxide……...27.00%
Derived From: Biosolids and Calcium Hydroxide

Beneficial re-use of Bioset Class A EQ

A high volume commercial fertilizer or manure spreaders will spread the material in any form - (cake or dry)

Conclusions

- Regardless of the features & benefits of technology selected – need to produce a material that is sought after locally
- Start with marketable product and select technologies that produce it – then work through features & benefits
- In areas with low pH soil – alkaline stabilized products are favorable for creating market demand
- Where market demand is created, volume of Class A produced is not a concern

SCHWING BIOSET

Conclusions

- Bioset process exhibits great flexibility in system layout – All systems presented were retrofit applications that fit into existing structures
- “Closed” alkaline processes contains dust & odors which is preferable to “Open” systems with incomplete mixing
- Closed systems allow operations at reduced temperatures and resultant 30% operational savings
- Pilot unit available for test work or contract operations

Class A Biosolids Produced w/ Closed Alkaline Process

Thank you !

Any Questions?