

WDNR Panel Discussion Exceptional Quality Sewage Sludge

March 18, 2025

2024 Spring Biosolids Symposium

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WDNR Panel Discussion/Contributors

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- Class A Treatment Insp: [Fred Hegeman](#)
- Sludge Management Plan: [Stephen Warrner](#)
- Class A/EQ add-ons to the SMP: [Fred Hegeman](#)

Overview

Class A – Exceptional Quality Sewage Sludge/Biosolids

Frederick J. Hegeman, PE

March 18, 2025

Spring Biosolids Symposium

Background: Exceptional Quality (EQ) Biosolids

- Class A \neq EQ
- Class A \rightarrow Pathogen Treatment
- EQ \rightarrow
 - High Quality Metals (Pollutants)
 - **Class A Pathogen Treatment**
 - Appropriate Vector Attraction Reduction
- Typically,
 - If sludge meets Class A, then sludge meets EQ
 - Some exceptions
 - Concern w/ Location of Vector Attraction Reduction (VAR)

Consider using the phrases:

- EQ vs. Non EQ

In Place of:

- Class A vs. Class B

EQ Overview

EQ Definition [NR113.03(19)]:

“Sludge that meets the class A requirements for pathogens, as specified in s. NR 204.07(6)(a), the high quality pollutant concentrations as specified in s. NR 204.07(5)(c), and one of the pre-land application processes to reduce vector attraction as specified in s. NR 204.07(7)(a) to (i).”

- Pathogens
 - Class A
 - Class B
- Metals
 - High Quality
 - Ceiling Limits
- Vector Attraction Reduction
 - Appropriate VAR for Class A pathogen treatment

EQ Exemptions [See sub. NR 204.04 (03), Wis. Adm. Code] (1/2)

- s. NR 204.05(4)
 - Imported EQ sludge-no WPDES permit required.
- s. 204.06 (6), (7), (8)
 - Land Application Site Eval procedures
 - Reporting bulk EQ land application (i.e., Land application reporting)
 - Notification reports for sending EQ to others for add'l treatment



EQ Exemptions [See sub. NR 204.04 (03), Wis. Adm. Code] (2/2)

- s. NR 204.07 (2)
 - Approved Sites
- s. 204.07 (3) (b) to (j), (n) & (o)
 - (b) Specific setbacks & slopes
 - (c) GW & BR limitations
 - (d) Sites w/ rapid permeability limitations
 - (e) pH soil requirements
 - (f) Highly erodible sites related
 - (g) 30 day restricted access
 - (h) Soil compaction limitations
 - (i) Uniform application rqmt
 - (j) Transport vehicle requirements
 - (n) Radium-226 testing rqmt
 - (o) Table B setbacks & slopes, and Harvesting restrictions (food crops, feed crops, grazing, public access)
- S. 204.07 (8)
 - Application rates of bulk sludge

Examples of Proven EQ Programs

- Bagged Fertilizer product
 - Milwaukee Met
 - WI Dells/Lake Delton
- Liming & Nutrients
 - Dane/Iowa
 - Reedsburg
 - West Central Wisconsin Biosolids
 - Baraboo
 - Tomah
- Add'l Carbon & Nutrients
 - West Lake Superior San District
 - Appleton
- Nutrients & Soil Amendments
 - Rhinelander
 - Sturgeon Bay
 - Wis. Rapids
 - Heart of the Valley
 - Fox West
 - Lakeland

Focus: Class A Sewage Sludge



I. Definitions

- **Sewage Sludge**

- AKA Biosolids
- AKA Sludge
- NR 204.03(55)

“The solid, semi–solid or liquid residue generated during the treatment of domestic sewage in a treatment works.

Sewage sludge includes **scum or solids** removed in primary, secondary or advanced wastewater treatment processes and **material derived from sewage sludge.”**

II. Basic Class A Requirements [See Sub. NR 204.07(6), Wis. Adm. Code]

Class B Review

- Class B
 - Fecal Coliform Density
 - Geometric mean of 7 samples
 - 2,000,000 MPN or CFU/g T

OR

- Class B
 - Pathogen Treatment Process

Class A Requirements

- Class A
 - Monitoring for Pathogen Density
 - Fecal Coliform (1000 MPN/g TS) or
 - Salmonella (3 MPN/g TS)

AND

- Class A
 - Pathogen Treatment Process

* Add Monitoring from Storage

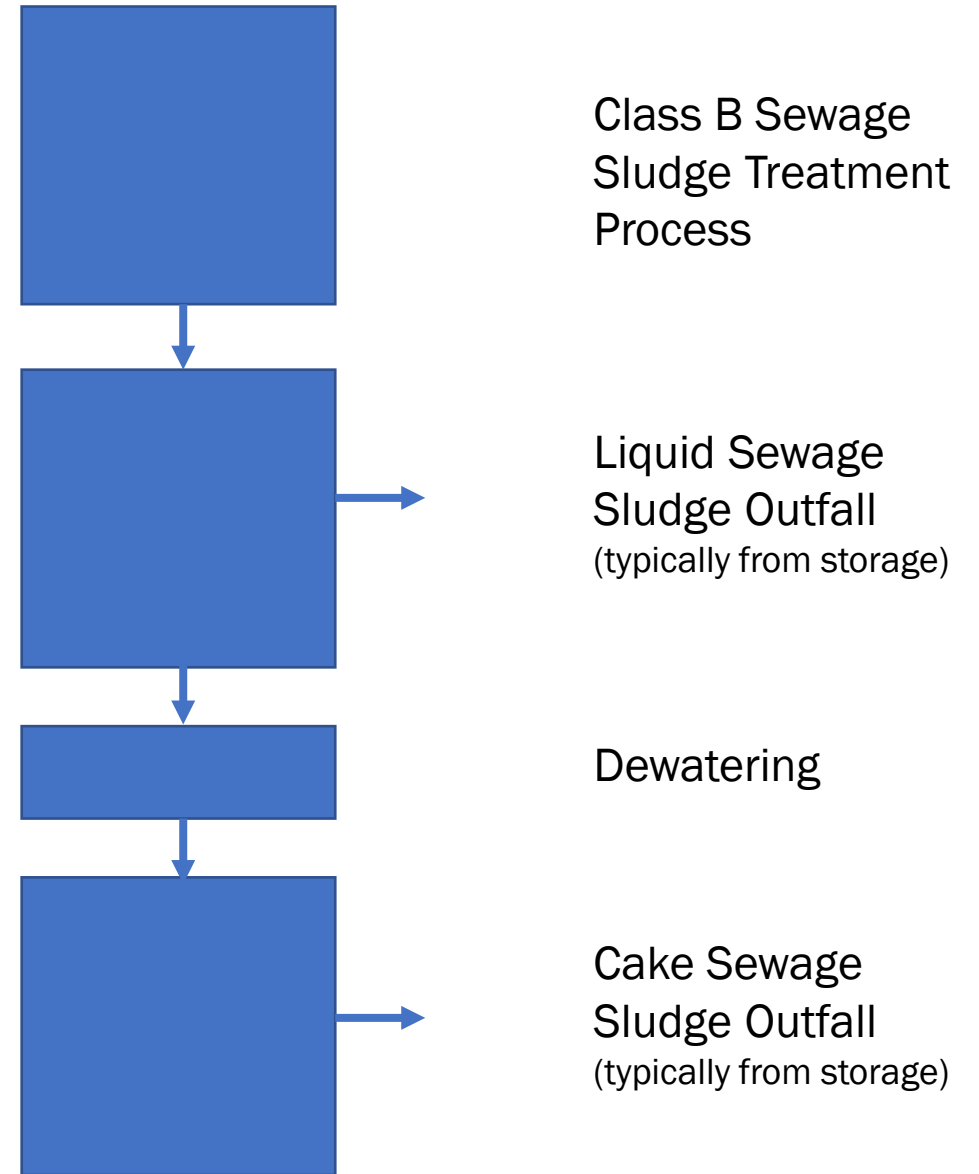
III. Basic Steps

- Decision to “go” Class A (EQ)
- Evaluate different equipment options
- Facility Planning
 - Plan Review Staff coordinate w/ Biosolids Coordinator
- Plan & Spec
 - Plan Review Staff discussion w/ Biosolids Coordinator
- WPDES Permit Timing
 - Modification vs Reissuance
- “Solids” Process Flow Diagram to identify:
 - Outfalls
 - Sample Points
 - Monitoring Efficiencies
- Develop WPDES Permit/Fact Sheet
 - Flexibility
 - Active/Inactive Outfalls
 - Requirements
 - Monitoring/Reporting
 - Data collection

Class B Outfalls

- Liquid Sewage Sludge
and/or
- Cake Sewage Sludge

- Fecal Coliform Density
and/or
- Class B Sewage Sludge Treatment

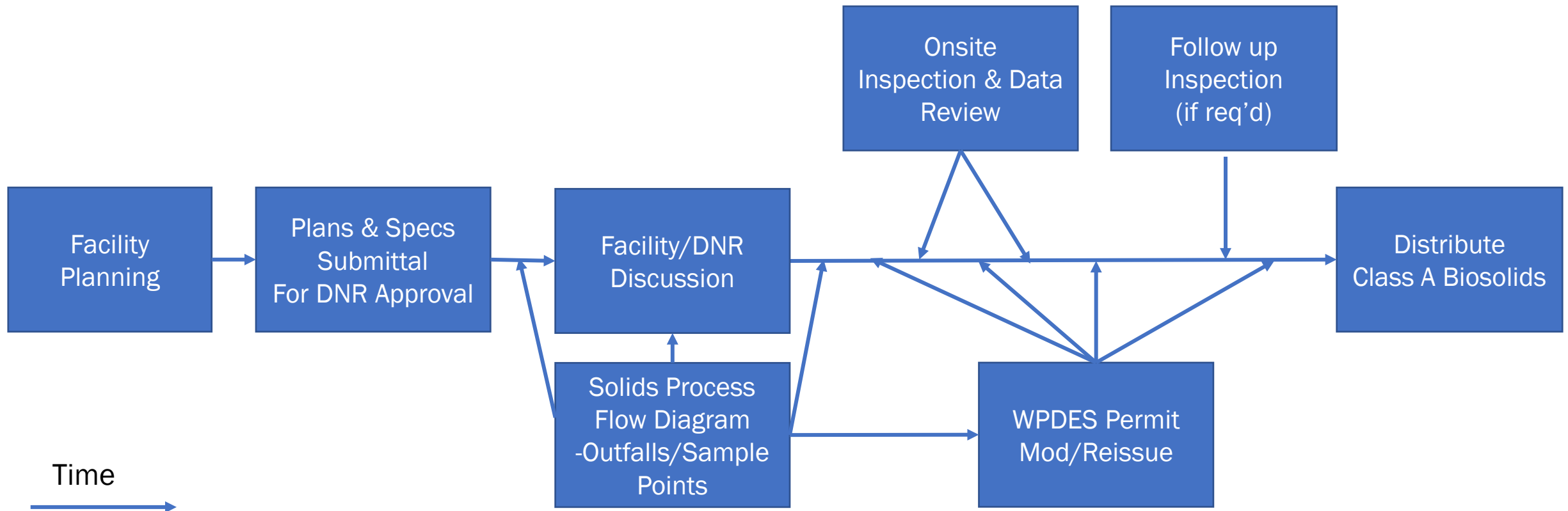


Review: Class B Pathogen Treatment Alternatives

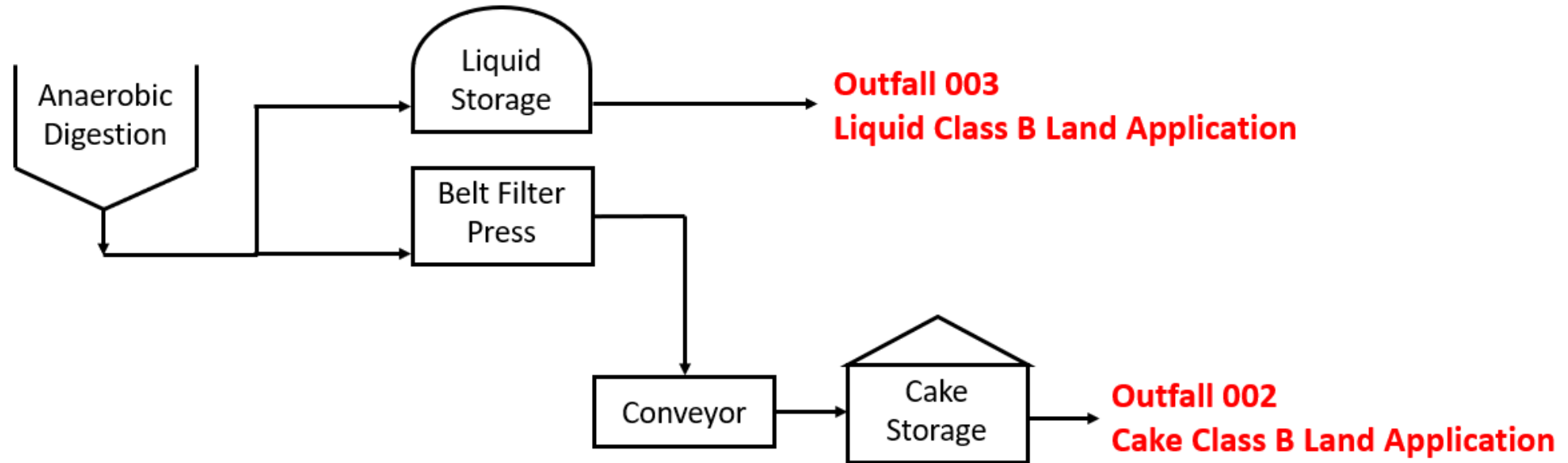
“Processes to Significantly Reduce Pathogens”

- Aerobic Digestion
 - Agitation or air is injected
 - Vol solids converted to CO₂, water and nitrate nitrogen
 - Time/Temp relationships req'd
- Anaerobic Digestion
 - Oxygen free environment
 - Vol solids converted to CO₂, methane and ammonia
 - Time/Temp relationships req'd
- Air Drying (drying beds)
 - Partially digested sludge on drying beds
- Composting
 - Aerobic decomposition
 - Class B time/temp
- Lime Stabilization
 - Use quicklime, hydrated lime, or kiln dust/fly ash
 - Raise pH to 12 after 2 hours of contact
- PSRP Equivalent Processes
 - USEPA's Pathogen Equivalency Committee (PEC) approves processes

Dept Interaction: Class A Compliance



Existing Class B Process Flow Diagram

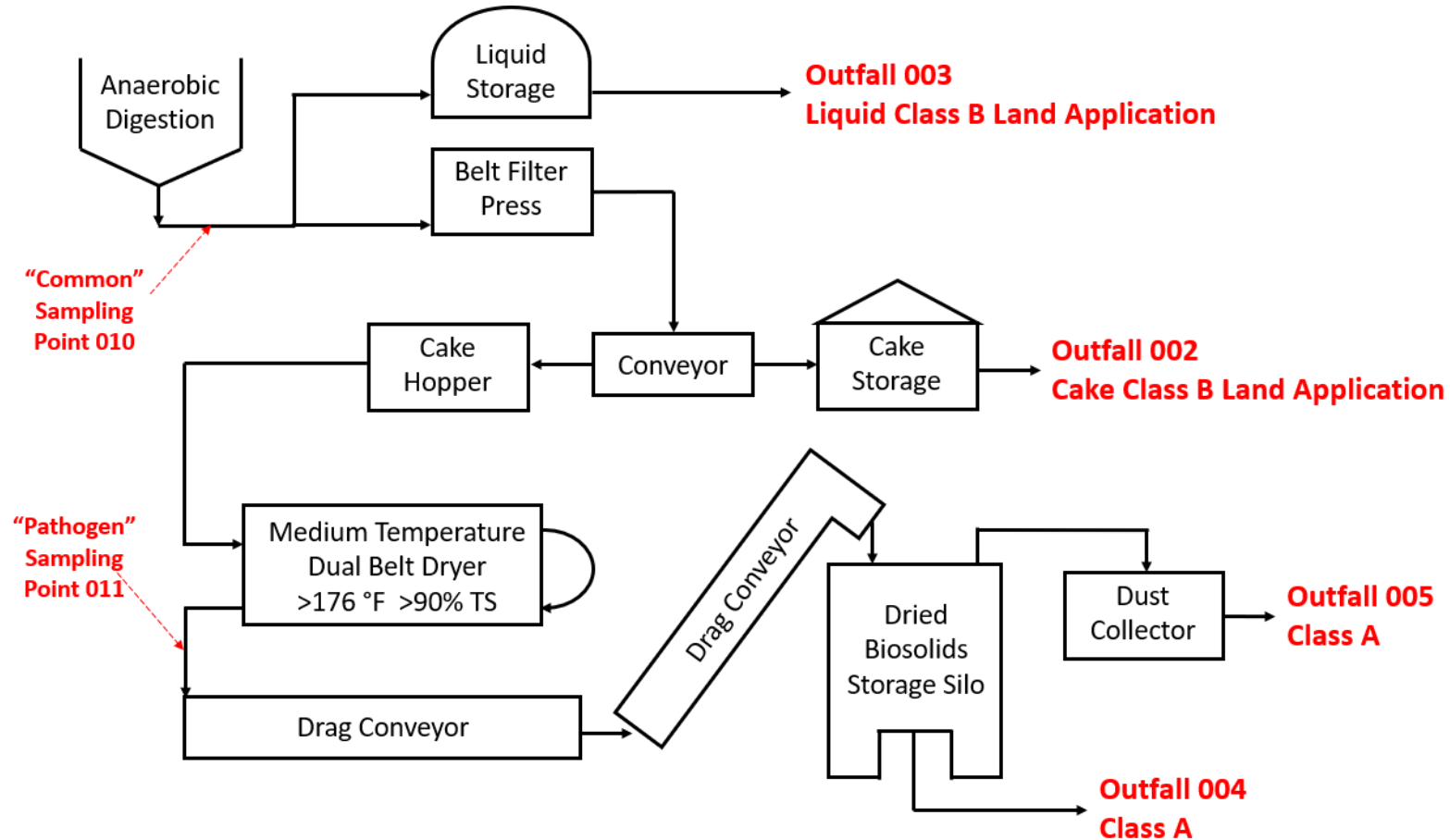


Considerations:

Liquid Sewage Sludge
and/or
Cake Sewage Sludge

Fecal Coliform Density
and/or
Specific Class B Sewage
Sludge Treatment

Proposed Class A Process Flow Diagram



Class A: Pathogen Density

Fecal Coliform

- Limit: 1000 MPN/g TS
- Approved Methods:
 - EPA 1680 (LTB-EC)
 - EPA 1681 (A-1)
 - Std Methods 9221E (2014)
 - Std Methods 9222D (2015)
- Hold Times:*
 - 8 hours except 24 hours for Class A compost

*Federal Register: Vol. 77, No. 97, May 18, 2012. Table II, 1-5. Footnotes nos. 22 & 23.

Salmonella

- Limit: 3 MPN/4g TS
- Approved Methods:
 - EPA 1682
- Hold Times**
 - 8 hours (no exceptions)

** Federal Register: Vol. 77, No. 97, May 18, 2012. Table II, 8. Footnote No. 22.

Class A: Treatment Process [40 CFR 503]

- **Alt 1: Thermally Treated Process**
 - Regime A: $\geq 7\%$ & not Regime B
 - Regime B: $\geq 7\%$ small particles, heated by gases or immiscible liquids
 - Regime C: $< 7\%$ solids & < 30 minutes contact time
 - Regime D: $< 7\%$ solids & ≥ 30 minutes contact time
- **Alt. 2: High pH-High Temperature Process (Alkaline Treatment)**
- **Alt. 3: Treated in Other Processes (Prior Testing)**
- **Alt. 4: Treated in Unknown Processes (Post Testing)**
- **Alt 5: Use of PFRP**
 - Composting
 - Heat Drying
 - Heat Treatment
 - Thermophilic Aerobic Digestion
 - Beta Ray Irradiation
 - Gamma Ray Irradiation
 - Pasteurization (liquids)
- **Alt. 6: PFRP Equivalent Process**
 - National Equivalency Recommendations
 - USEPA Pathogen Equivalency Committee
 - Site Specific Equivalency Recommendations
 - USEPA Pathogen Equivalency Committee
 - Permitting Authority

Class A: Treatment Process [NR 204]

- Temp/Time
- Alkaline Trmt
- Prior/Post Testing Enteric Virus/Viable Helminth Ova
- Composting
- Heat Drying
- Thermophilic Aerobic Digestion
- Beta Ray Irradiation
- Gamma Ray Irradiation
- Pasteurization
- PFRP Equivalent Process

Important Class A Treatment Considerations

- Class A vs. VAR:
 - Class A requirements shall be met prior to or at time of meeting the vector attraction reduction requirements. [See NR 204.07(6)(a)]
- Sludge Temperatures measured by Probes “into” the sludge
 - Infrared (IR) monitoring often has interferences such as dust or humidity
- Discrete Organism Sampling
 - No Geometric Mean for Class A
- Monitoring Frequencies
 - Time/Temp
 - Organism Densities
 - Retesting
- Startup, operation & shutdown concerns if non-continuous operations (i.e., dryer, etc)
- Batch loading vs. Continuous feeds (Digesters)
 - Short circuiting
- Data Storage
 - Data Review

Example: Dryer

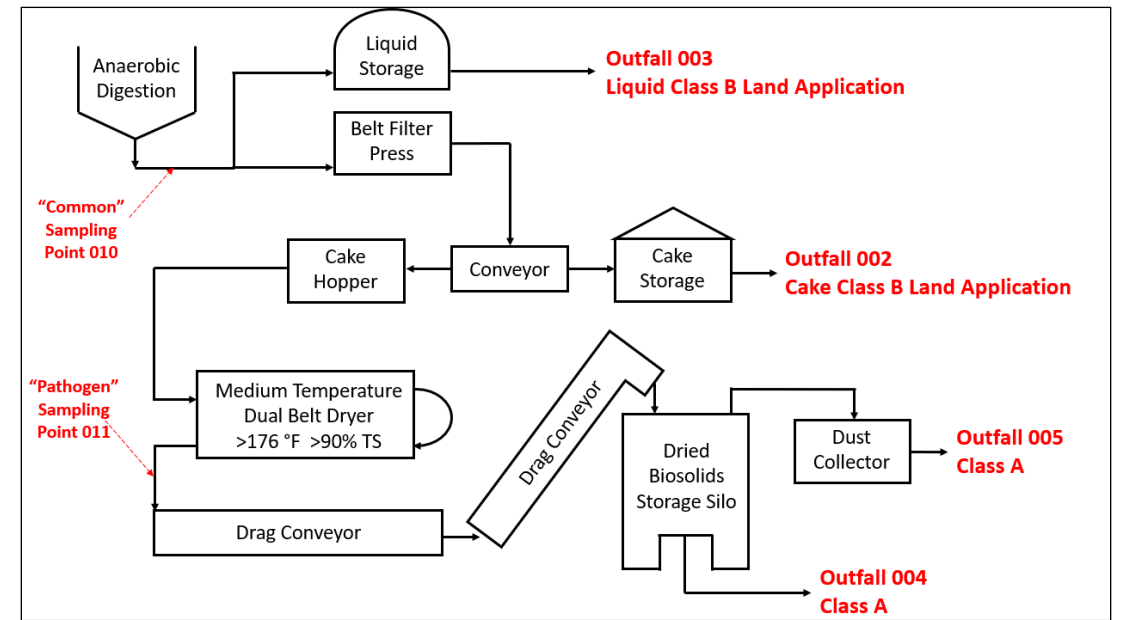
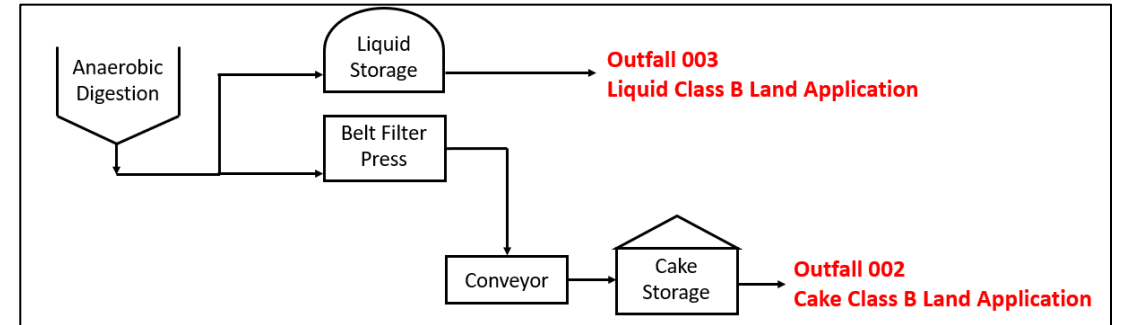
Which Alternative?

- Heat drying:
 - ≥ 80 deg C (Sludge or Wet-bulb temp of gas exiting w/ sludge)
 - $\geq 90\%$ total solids
- Time/Temp:
 - Std. Belt Dryer:
 - Regime A: $\geq 7\%$ solids, ≥ 50 deg C, ≥ 20 min of treatment
 - At 80 deg C \rightarrow 20 min
 - At 71.25 deg C \rightarrow 20 min
 - At 70 deg C \rightarrow 29.9 min
 - At 68 deg C \rightarrow 57 min
 - At 60 deg C \rightarrow 751 min (12.5 hrs)
- Pasteurization:
 - Typically, not used with dryers...sludge is not a liquid
 - ≥ 70 deg C and ≥ 30 min
 - Often not compatible with Dried Solids for $\geq 7\%$ solids...solids not mixed.

WPDES Permit Flexibility

Flexibility equals:

- More Complex Permit
- More Outfalls/Sample Points
- More Monitoring
 - Operating Details
 - Parameters
 - Lists 1, 2, 3 & 4 and Others
- More Reporting
- More Complex and Descriptive Sludge Management Plan
- What ifs:
 - Equipment failure, incomplete monitoring, emergencies, EQ not desirable, etc



Take Home Messaging

- Focus: Demonstrate Class A Treatment compliance
 - Temp Collection
 - Time durations (if req'd)
 - Other data specific to treatment process (Ex: % solids)
- Does treatment process work? Demonstrate Compliance!!
- Has the treatment process been implemented elsewhere?
 - USEPA
 - USEPA PFRP Pathogen Equivalency Committee
 - National Equivalency
 - Site Specific
 - Wisconsin or other Delegated State
 - Does Wisconsin have more restrictive requirements than other approvals
- New or enhanced equipment: Communicate w/DNR early