DETERMINATION OF VOLATILE SOLIDS REDUCTION

What are Volatile Solids?

- the portion of total solids present in sludge that have a calorific (food) value
- organic compounds of plant or animal origin
- removed or reduced through biological processes

calorific value *n.* The calories or thermal units contained in one unit of a substance and released when the substance is burned.

Why do we care?

- provides food for not only microbes, but also potential vectors (insects etc.)
- Increase in potential odors → Complaints
- increases attraction of vectors which can aid in transmission of diseases

Common VAR Issues

- Not using correct method to calculate VAR
- Not using the correct method correctly
- Mixing Pathogen issues with VAR
- Planning for difficult times
- Certification Statements

Vector Attraction Reduction (VAR) Requirements

- (3) 38% VSR
- (4) Anaerobic - bench scale test (40 days)
- (5) Aerobic - bench scale test (30 days)
- (6) Aerobic - SOUR =< 1.5mg O2/hr @ 20 °C
- (7) Aerobic - 14+ days @ >40 °C (avg >45 °C)
  - e. g. composting
- (8) pH 12+ for 2 hr then 11.5+ for 22hr
- (9) Dry to 75% when stabilized solids used (digested)
- (10) Dry to 90% when unstabilized solids used (undigested)
  - e.g. oxiditch
- (11) Sub. injection (no significant after 1hr)
- (12) Surface application w/incorporation (w/in 6hrs)

Requirements (continued)

- **38% VSR**
- measured across any part of the sludge-specific process (NOT the WASTEWATER PROCESS)
- Common Calculations used in determining Volatile Solids Reduction (VSR)
  - Van Kleeck
  - Full Mass Balance
  - Approximate Mass Balance

Information requirements for each of the Calculation Mehtods

- Van Kleeck
  - Generally the simplest
    - Need VS in the Feed VS_{in}
    - Need VS in the finished product VS_{out}
    - No Flow data needed
  - Restrictions in use

Van Kleeck

- Assumes that fixed solids are conserved (remain unchanged)during the digestion process
- Suitable only for steady-state, continuous mix digesters with no decant or significant grit accumulation
- Generally Conservative
  - Results are lower than actual
- Most commonly used
- Requires least inputs

Requirements (continued)

- Anaerobic - bench scale test (40 days)
  - often used for lagoon solids
  - < 17% additional VSR
  - Method requires Additional 40 days @ 30-37oC
- Aerobic - bench scale test (30 days)
  - <15% additional VSR
  - Method requires Addition 30d @ 20oC and %TS ~ 2%
- Calculations as Above

Requirements (continued)

- Aerobic - SOUR =< 1.5mg O2/hr @ 20 °C
  - Run right away for processes between 10 – 30oC
  - Run at < 2%TS
  - %TS < 0.5% will produce erroneous results

Requirements (continued)

- Aerobic - 14+ days @ >40 °C (avg >45 °C)
  - e. g. composting

Requirements (continued)

pH 12+ for 2 hr then 11.5+ for 22hr

- Raise the pH to at least 12
- Maintain a pH of at least 12 without addition of more alkali for 2 hours
- Maintain a pH of at least 11.5 without addition of more alkali for an additional 22 hours

Requirements (continued)

- (9) Dry to 75% when stabilized solids used (digested)
- (10) Dry to 90% when unstabilized solids used (undigested)
  - e.g. oxiditch

Requirements (continued)

- (11) Sub. injection (no significant after 1hr)
- (12) Surface application w/incorporation (w/in 6hrs)