Experts Review of Aerobic Treatment Unit Operation and Maintenance

Bruce Lesikar
Texas AgriLife Extension Service
Overview

- Overview of Aerobic Treatment Units
- Installing for accessibility to system components for conducting maintenance
- System maintenance is critical for all onsite wastewater treatment systems
- Describe operation and maintenance activities.
- Sharing information regarding operation and maintenance
Components

- Trash Removal/Aerobic Treatment
- Aerobic Treatment
  - Mixing of the Food & Bacteria
  - F/M ratio
- Air Supply
- Clarification
- Sludge Return
Trash Removal and Anaerobic Treatment.

- Generally referred to as the “trash tank” or septic tank
  - Removes non degradable materials from the waste stream.
  - Provides anaerobic treatment.
  - Can be used as a component of a denitrification process
Microbes for Wastewater Treatment

- **Microbes**
  - Provide treatment
  - Must keep them healthy
    - Food
    - pH
    - DO
    - Temperature

- **Healthy Environment**
  - Aerobic microbes
  - Facultative microbes
  - Anaerobic microbes
Loading

- **Water – Hydraulic**
  - Flow volume, GPD
  - Velocity
    - GPM
    - GPH

- **Food – Organic**
  - BOD
    - Concentration, mg/L
    - Mass, Pounds per day
Types of Aerobic Treatment Units

- Submerged Aerobic Treatment Systems
  - Suspended Growth
  - Submerged Attached Growth/Fixed Film
  - Sequencing Batch Reactor
  - Rotating Biological Contactor
Suspended Growth

- Aerobic microbes free swimming in the aeration chamber
- Mixing in the chamber mixes the microbes and the wastewater contaminants
- Microbial growth in equilibrium with the organic loading, Extended aeration
**Submerged Attached Growth / Fixed Film Media**

- Media is submerged in the aeration chamber
- Microbes are attached to the media
- Effluent is circulated through the media thus passing contaminants by the microbes
- Microbial growth in equilibrium with the organic loading, Extended aeration
Sequencing Batch Reactor

- **Suspended growth treatment process**
- **Utilize a single chamber for achieving aeration, clarification and anoxic conditions**
- **Flow equalization chamber for dosing effluent into the treatment chamber**
Rotating Biological Contactor

- Fixed film media
- Media is a disk
- Motor slowly rotates disks through the effluent
- Aeration is achieved by passing the media through the air space in the chamber

System venting for air
Installation for O&M

- Appropriate assembly
- Water tightness
- Accessibility for O&M
Appropriate Assembly

- Components
- Elevation
- Level
- Stable backfill
Water Tightness

- Critical for treatment
  - Water entering
  - Water exiting
- Hydraulic overloading flushes system
  - Partially treated wastewater exits
  - Solids carryover
  - Dilutes microbial population
Accessibility for Maintenance

- Manufacturers guidance
- Risers to surface
- Appropriate size openings
- Appropriate depth
- Connections to components
Operation

- General operational status
- Operational status of the five components
General Operation

- Odors present
  - Aerobic
  - Anaerobic
  - Location
- Risers & Drainage
- Power to panel
Trash Tank - Operation

- Not present on some units
- Determine depth of scum, solids, clear zone
- Baffles present
Aeration Chamber - Operation

- Mixing
- Color of biomass
- Microbial population
- Sludge depth
- Dissolved oxygen
- pH
Air Supply - Operation

- Operating status
  - Pressure
  - Vacuum
- Air flow
Clarification - Operation

- Water column
- Scum present
- Clear zone depth
  - Relation to outlet
- Settling solids in bottom
- Color of solids
Sludge Return - Operation

- **Passive**
  - Solids returning

- **Active return**
  - Pump operational
  - Depth of solids
Maintenance

- All technologies require maintenance
- Frequency and activities vary
- Types
  - Routine - scheduled
  - Unscheduled – response to alarms
- Five components of system
Trash Tank - Maintenance

- **Pumping**
  - Remove all materials from the trash tank
  - Check baffles when pumped
  - Structural review
  - Water tightness review
Aeration Chamber - Maintenance

- **Pumping**
  - Suspended mixed liquor
  - Sludge in bottom of tank
Aeration System - Maintenance

- Cleaning inlet
  - Filters
  - Screens
- Distribution
  - Piping
  - Aspirator
  - Diffusers
- Air pumps
  - Motors
  - Heads
  - Vanes
Clarification - Maintenance

- Scum removal
  - Spraying
  - Mixing
  - Removal
- Sides of clarifier
- Active filtration
  - Bio-filters
  - Socks
Sludge Return - Maintenance

- Passive
  - Solids returning

- Active
  - Solids removal
  - Changing pump run time
Response to Alarms

- Type of alarm
  - Water level
  - Air supply
  - Electrical
- Response time
  - 48 hours
Monitoring

- Performance criteria
  - Compliance

- Effluent quality
  - Biochemical Oxygen Demand, BOD$_5$
  - Total Suspended Solids, TSS
  - Fecal Coliforms
Service Contracts

- First two years
- On-going service
- Type of contract
  - Operation
  - Maintenance
  - Monitoring
  - Repairs
  - Responsible management entity
Documentation of Service

- Routine service reports
  - Homeowner
  - Permitting authority
  - Weather proof tag
- Alarm response reports
  - Homeowner
  - Permitting authority
  - Weather proof tag
- Door hanger, business card
- Talk to the occupant in the home
Notification of Alarms

- Audio / visual alarms
  - Homeowner contacts service provider
- Electronic Monitoring and Automatic Notification
  - Service provider
  - Answering service
  - Electronic recording and notification
Verification of Service

- Regulatory function
- Office activities
  - Review work
  - Record keeping
  - Tracking
- Field activities
  - Spot check reports
  - Verify signatures on tag
- Electronic verification
  - Service provider went to site
Summary

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