Pump Tank and Pretreatment Inspection & Troubleshooting

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Evaluate Presence of Odor

- Odors are improper venting
- Check seals
  - Lid
  - Conduit
Tank Access

a. Access location:
b. Located at grade?
c. If ‘No’, how deep is lid buried?
d. Risers on tank?
e. Evidence of infiltration in risers?
f. Lids securely fastened?
g. Lid in operable condition?
Current Tank Operating Conditions

a. Liquid level relative to inlet
b. Maximum depth
Current Tank Operating Conditions

c. Height with respect to alarm (inches):

d. Evidence liquid level has been higher:
   - Stains
   - Material hanging on the lid

e. Evidence liquid level dropped without pumping?
Pump

- Pump under access
  - Reachable from surface
  - Removable
  - Note if not
Pump Should Be

- Elevated off bottom
  - Storage
- Covered with effluent
  - Protection
Pump Placement

- Pump must be up out of the solids layer
  - unless it is a grinder pump
- A block is common
  - but not recommended
    - hard to find when tank is full of sewage
    - pump torque will move pump
    - no screen
Pump Removal?

- Pull chain or rope present
- Make sure it is secure when leaving the site
- Loose ropes sink pumps
Snake Removal?
Discharge Assembly

Quick disconnect present?

Fernco is not a quick disconnect!
Electrical Components Sealed and Watertight?
Electrical Conduit Sealed?
How is the Pump Operated?

- Float - Piggy back
- Control panel
  - Float - Demand
  - Panel functions
    - Running time clock
    - Event counter
- Timer panel
Does the Pump Work?

- On/ Off
- Alarm
How to Check?

- Lift the float
- Fill the tank to operate
- Run a dose
  - Check gpm \{flow rate\}
  - Gallons per inch x inches ÷ time = gpm
Drain Back?

- Weep hole
- Check valve
  - Freezing
Is the Pump the Right Size?

- **Flow**
  - rate that water needs to be moved

- **Pressure (or head)**
  - the pressure required to generate the required flow
  - calculated by knowing
    - elevation difference
    - friction in pipes and fittings
    - required pressure at distal end
Using a Pump Curve

- One-half horsepower
  - the turbine pump can produce high head at low flows
  - the other pump cannot produce much head but has high flow
- notice the curve shape
Alarm?

- Separate circuits?
  - Shut off circuit in basement for alarm
    - Pump still operational?
  - Only lift it up if you can silence @ panel
- Be careful as lifting to not damage
Electrical?

Smoke
Sparks
Shock
Electrical Components Sealed and Watertight?
Electrical Conduit Sealed?
Tank Pumping Recommended?
Pretreatment Units
Why Aerate?

- Aerobic environment
  - Has dissolved oxygen
  - Aerobic microbes break down waste
    - Faster than anaerobic treatment
    - Little odor
Fixed Activated Sludge System
Types of Aeration Devices

- Aerobic Treatment Units (ATUs)
  - Saturated units - bubble air through water
- Media Filters
  - Unsaturated units - diffuse air through pore space
Aerobic Treatment Unit

- **Aerobic tank**
  - Saturated environment (liquid)
  - Incorporates dissolved oxygen (2 mg/L)
    - Organisms break down organic matter into
      - CO₂
      - H₂O
      - Produce new organisms/cells
  - Higher quality effluent than septic tank
    - Less TSS
    - Less BOD
  - Bacterial cells accumulate, must be dealt with
Comparisons of Domestic WW Effluent

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<th>Constituent</th>
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<th>ATU</th>
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Siegrist, 2001
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Treatment Train

May all be in one or two units
Layout

- ATU positioned after septic tank or trash tank
  - Reduces amount of solids entering ATU
  - Provides some flow equalization
Aerobic Treatment Unit

- Typical components
ATUs: Miniature WWTP

- Biological processes are well understood
- Mix microbes, wastewater, and dissolved oxygen
Hydraulic and Organic Loading

Two main design parameters

- **Hydraulic Loading**
  - Rate that water will pass through the device
  - Must provide sufficient retention time
  - Wash-outs can occur on laundry day

- **Organic Loading**
  - Organic matter is food for microbes
  - More food than microbes - poor quality effluent
  - More microbes than food - high quality effluent
What should it look like?

- Air operating
- DO > 2 mg/l
- Musty odor
  - Rotten eggs
- Brown color- Chocolate
  - Black
  - Clear
- Settling
  - 50% in 15 min.
- Effluent quality
DO Testing

- Meter
- Kit
Color
Smell
Look
Foam

- Color
  - White & Soapy
  - Gray/ Black
Low DO

- Air problems
  - System
  - Owner
- High organic loading
Microbial Biomass Management ~Wasting

- Sludge wasting is required to reduce the quantity of biomass in the system.
- Frequency depends on the waste load into the system. High organic loading requires larger microbial population to transform waste.
- SG: 30 minute settle ability test is used to determine when system needs pumping.
- FF: Plugging of media {50%}
Media Filters
Description

- Watertight structure with media of particular specifications
- After being collected in a processing tank, effluent is distributed (by pressure or gravity) over the surface of the media
- Media provides surface area for bacteria and other microorganisms to treat the effluent
- Aerobic treatment zone
Description

- Media is typically unsaturated
- The presence of air promotes establishment of favorable microorganisms
- Effluent percolates through media to under-drain system where it is collected for further treatment
General Wastewater Flow

From septic or recirculation tank

Effluent distribution network

Media bed

Underdrain

To final dispersal or recirculation
Single-Pass Media Filters (SPMF)

- Usually pressure dosed, but some are gravity fed
- Applied wastewater infiltrates the filter surface
- Percolates through the filter *only once*, then flows to the next treatment step
- Treated effluent then flows to STA
- Usually quite effective in removing BOD, TSS, and pathogens
Recirculating Media Filters (RMF)

- Multi-pass filters
- Wastewater is treated by mixing effluent that has passed through the media bed with raw septic tank effluent.
- Filtrate from the media filter is split
  - A portion returns to the recirculation tank for more processing and a portion goes out for final dispersal.
- Recirculating media filters are effective in reducing BOD, TSS, and total nitrogen.
Flow Path in a RMF
Troubleshooting Media Filters
Problems in Filters

- Ponding
- Performance
  - Pathogens
  - Nutrients

*Use of a timer will make the system more effective
Assess system

- Infiltrative surface
- Replacement activities
  - Peat
  - Plantings
- Distribution system
- Drainage system
- Effluent quality
Accessibility

- **Operation**
  - Surface of filter
  - Drainage operation
  - Effluent quality

- **Maintenance**
  - Distribution System
  - Media issues
Ponding

- Ponding is a problem
  - Single pass
  - Recirculating

- Media selection
  - Peat
    - Depth
  - Textile
  - Wetlands
    - Plants

- Loading rate
  - BOD
  - H2O
Media
Ponding- O2 relationships

- Overloading
  - Water {Hydraulic}
  - Food {Organic}
- Oxygen flow
Media

- Media quality
  - Sand
  - Synthetic
- Wetland vegetation
- Quantity-
  - Depth
    - Peat
    - Synthetic
Media depth-

- 24” typical
- Organic
  - Dissolve
  - Compact
- Replace
  - < 25%
  - 6”
  - Rebuild
Constructed Wetland

- Vegetation
- Levels
- Sizing
- Distribution
  - Ponding
Drainage

- Saturation - No air movement
- Design - [float sep.]
- Plugged drainage---
  Ponding
Distribution in Filter

- Squirt height
- Uniform design
- Pattern
  - Listen
Media filters

- Single pass

- Septic tank with effluent filter
- Pump tank
- Single pass sand filter
- Pump tank
- Soil treatment
- Watertight liner

*Use of a timer will make the system more effective
Container integrity

- Water tight
- Lids/ Access
- Insulation
Questions?