6th Northeast Onsite Wastewater Treatment Short Course
and Equipment Exposition

Drip Distribution
Design, Installation and Service

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Drip Distribution
Design, Installation and Service

- The devil is in the details
  - design details
  - hydraulic details
  - electrical details
  - installation details
  - maintenance details
  - operational details

Build the system as if **you** are going to be the service provider for the next 20 years

Remember

- This is a **SYSTEM**
  - pump tank, pump and pump controls
  - pipes, fittings, valves and meters
  - filters, supply manifolds, laterals, emitters
  - return manifolds, flush lines
- **All** of these items have to work in order for **drip** to work

Design Details

- Siting the system
  - no ponding of surface water
    - away from house gutters
  - the laterals must be on contour
    - this does not mean that the depth of tubing must be consistent
  - understand the soil boundaries
    - limiting layers
    - use of property (no cars on drip zone)
    - depths of frost layer

Design Details

- Application rate
  - gallons per day per square foot
    - the difference between 0.2 and 0.1 is twice as much area dedicated to the drip system
  - How are you going to determine the application rate?
    - 0.2 gallon per day per square foot is equal to 0.32 inch of rain per day – everyday
    - this is 117 inches of water in addition to rainfall
      - can the soil drain this much water?

Design Details

- Design Pressure
  - need to account for
    - pressure during dose
    - pressure during backflush of filter(s)
    - pressure during forward flush of tubing
- Determine if one pump can do all of this
  - if not
    - dose two zones then forward flush one zone
    - or use one pump to dose and two pumps to forward flush

Design Details

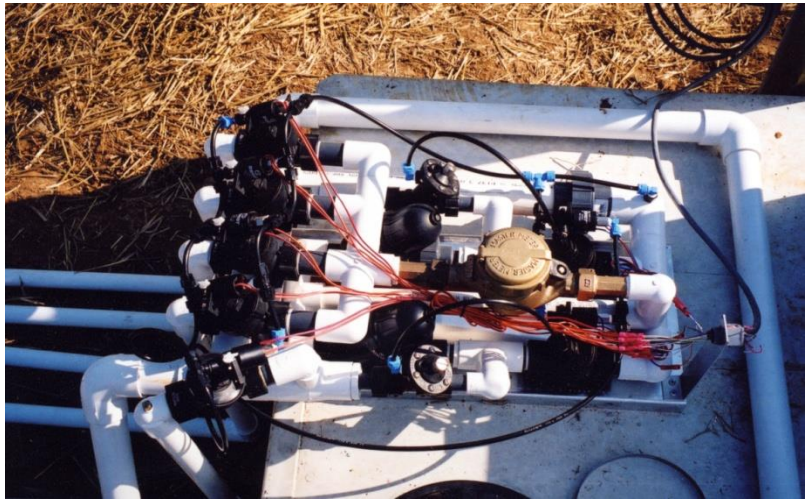
- Demand watertight tanks and risers
  - infiltration is the issue
    - you do not want any extra water in your system
  - make sure that grommets and gaskets are sealed
  - fill tank to top of riser when doing watertightness test

Design Detail

- All “boxes” on the soil surface should be able to handle the lawn equipment
  - meter boxes, valve boxes, riser lids, access points,
  - mower weight and weedeater lashing

Design Details

- Always have at least two zones
  - alternant with each dose
  - or dose two and flush one
- If more than two zones
  - use an “even” number of zones
  - dose two and flush one



Design Details

- Forward flush solids from tubing to septic tank
  - not to pump tank
  - however, make sure that this will not hydraulically affect the treatment unit
    - many secondary treatment units are sensitive to sudden hydraulic loads
- Backwash filters when pressure drop across filter is greater than 5 psi
  - or backwash on frequent schedule

Design Details

- Design to be maintenance friendly
  - risers to the soil surface
    - with appropriate child-proof devices
  - install tracer-wire with hydraulic system
  - electrical breakers at the control panel

Design Details

- System monitors
  - pressure gauges
  - water meter
  - event counter
  - elapse time meter

Hydraulic Details

- Pump(s)
  - must be rated for effluent
  - preferably in a screened vault
  - union on discharge pipe for easy pump removal
  - need to be held off the bottom of pump tank

Hydraulic Details

- Isolation valves
  - shut off zones to allow maintenance without shutting down whole system
  - prevents backflow if zones are at higher elevation than pumps and controls

Hydraulic Details

- Unions
  - place unions on both sides of any component that needs maintenance or replacement
    - diaphragm valves, filters, pumps, manifolds

Hydraulic Details

- Threaded fittings
  - glue joints are fast, but permanent
  - threaded connections allow for part replacement
  - pipe nipples are a better alternative than male adapters
    - can be made on-site from sch 80 PVC and pipe-threader

Hydraulic Details

- Connecting metal pipe to plastic pipe
  - **always thread plastic into metal**
  - plastic male fitting to metal female fitting
  - plastic cannot withstand the tension of being threaded by a metal fitting
  - using plastic male fitting puts the plastic in compression

Hydraulic Details

- Use ball valves that do not “stick”
  - consumer-grade PVC ball valves are notorious for sticking in place
  - look for brands of PVC ball valves that move easily and do not “stick” even after months of not moving
    - Lowes and Home Depot do not carry these valves

Hydraulic Details

- Install filter body such that it drains between doses, or make it freeze-proof
- Watch for spider webs in air/vacuum relief valves
  - the silk can jam the movement of the ball
  - also, watch out for **BLACK WIDOWS**, they love meter boxes

Hydraulic Details

- Use pair of filters in parallel
  - one filter can be used to provide “filtered” water to backwash the other filter
- Keep spare filter elements
  - sometimes the elements need to soak in a bucket to loosen scale and other debris

Hydraulic Details

- Pressure Gauges
  - liquid filled
    - cost a little more, last a long time
  - schrader valves
    - looks and works like a air-valve on a tire
    - can use to measure water pressure
  - locations
    - top of pump, both sides of filter(s), on supply manifold, and return manifold

Electrical Details

- **No Splices in Riser over Pump Tank or Septic Tank**
  - purchase pumps and floats with sufficient cable length to reach the control panel

Just Plain Dumb

Cables and Conduit

- One cable – one conduit
  - between control panel and pump tank
  - pull defective pump or float out and “fish” the new cable through conduit

Electrical Details

- Gastight, strain-relief, cable clamps
  - prevent acidic gases from entering control panel
  - more predictable than a “dab” of caulk
- Safety locks on control panel
  - need to child-proof the whole system

Electrical Details

- Surge protection for the control panel
  - use appropriate grounding
  - cannot make a panel lightening proof, but can make it resist near misses.
- Ground fault interrupts
  - electricity and water do mix
- Separate circuits for pump and pump controls
  - if pump trips circuit breaker, then alarms still works

Electrical Details

- Three boxes
  - two circuit breakers
  - treatment control panel
  - drip control panel
- Packaged treatment with drip – only need one panel

Installation Details

- Do not install tubing in wet soils
  - soil smearing is not a huge issue with drip, but do not press your luck
    - typically see less smearing with vibratory plow
    - typically see more smearing with trencher
- Overfill any backfill to reduce surface water ponding in trenches

Installation Details

- Use blank tubing (without emitters) to go over shallow rock
  - tubing is available without emitters that has the same internal diameter and splices onto the drip tubing
- Use flexible sch 40 pipe to construct loops and for transitions out of (and into) manifolds
  - this tubing will not kink

Installation Details

- Do not allow the drip tubing to kink during installation
  - if it does, cut that portion out and splice the tubing back together

Installation Details

- Watch for stretching of the tubing during installation
  - make sure that the tubing is going into the ground at the same rate that the plow is moving
  - tubing can stretch an incredible distance and then shrink back after tension is released

Installation Details

- Head Works
  - Need to control
    - Pumps
    - Valves
    - Filters
    - Forward flush
    - Metering
  - Insulate from freezing
  - Can you reach the filter?

Operation & Maintenace

- Tools
  - Eyes, ears, nose, hands
  - Water meters
  - Pressure gauges
  - Floats
  - Event counters
  - Event timers
  - Programmable controllers with memory

Operation & Maintenance

- Eyes, ears, nose, and hands
  - Walk the system
  - Look for wet areas
  - Look for dry areas
  - Listen and/or feel for excessive pump vibration
  - Look for pipe movement (water hammer)
  - Listen to relays – is there any chatter
  - Listen to the A/V relief valves
  - Listen for the solenoids on valves to click

Maintenance Details

- Automate the routine maintenance
  - backwash of filters
  - forward flush of tubing
  - programmable controllers
- On a schedule
  - disassemble the filters and really clean the elements
  - do a prolonged flush of the tubing
  - check all the valves for operation
    - the ones made out of clear acrylic are helpful

Maintenance Details

- Check pressure and flow
  - during dose
  - during forward flush
- Maintenance provider should know the design parameters for pressure and flow
  - if pressure is low and flow is high
    - may have leak
  - if pressure is high and flow is low
    - emitters may be clogging

Maintenance Details

- Do a system check after major thunderstorms and power outages
  - electrical surges are tough on the control panel
  - does not take a direct strike, just a highly charged atmosphere

Maintenance Details

- Look for “digging” in the drip zone
  - varmints
    - dogs, skunks, groundhogs, etc…
  - swing sets
  - birdfeeder posts

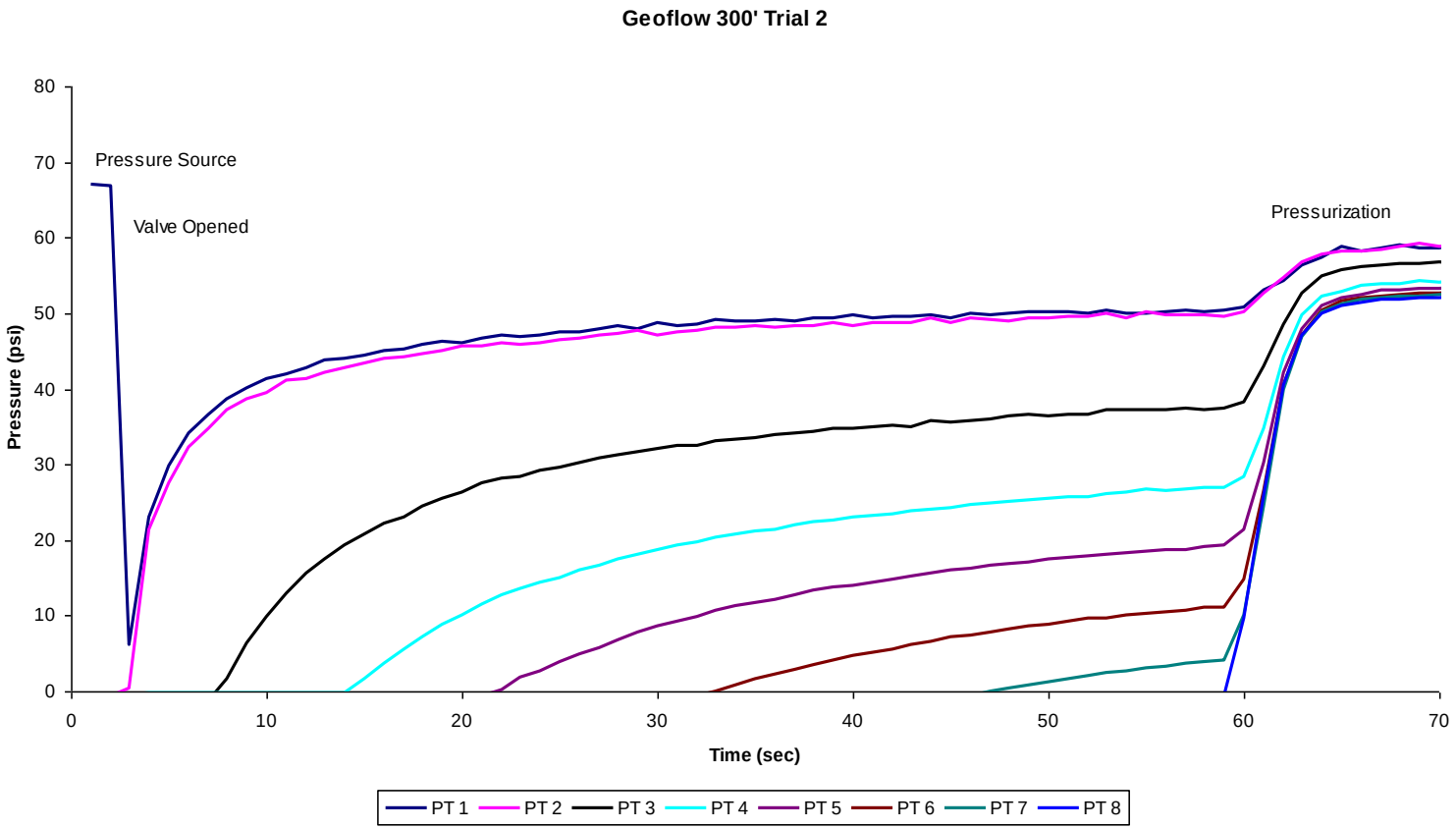
Operational Details

- Dose volume
  - balance frequency of pump start with volume of water that can be injected into soil
    - during dose, soil around emitter will saturate
    - need to prevent saturated conditions coming to soil surface

Operational Details

- Four phases of a dose cycle
  - pressurization
    - how long does it take to fill the system?
    - as tubing fills, proximal emitters start producing water
  - dose
    - several pipe volumes
  - depressurization
    - should be equal if on contour and no drainback
  - resting
    - allow soil to return to field condition

Dose Cycle


Geoflow 300' Trial 2
Pressure Source
Valve Opened
Pressurization
Pressure (psi)
Time (sec)
0
10
20
30
40
50
60
70
80
PT 1
PT 2
PT 3
PT 4
PT 5
PT 6
PT 7
PT 8

Operational Details

- Dose by clock and not by demand
  - not all doses will have the same volume
  - this will show up in the elapse time meter
- A smart control panel can increase the frequency of dosing for an occasional heavy flow
  - but will still leave significant resting time between doses
  - high flow condition alarm

Operation Details

- Educate the homeowner
  - what not to put down the toilet
  - acid drain cleaners
  - bleach
  - when alarm sounds, call somebody – don’t hit the silence button
  - have your phone number painted on the control panel

Discussion Time

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