To strengthen and promote the onsite and decentralized wastewater industry.

Troubleshooting Onsite Wastewater Pumps and Panels

Tom Fritts
Residential Sewage Treatment Co., Inc.
tom@residentialsewage.com
Why do pumps fail?

• Troubleshooting anything requires an understanding of the system or product you are inspecting

• The first part of this presentation will introduce you to the most basic principals of the pumps we use in the onsite industry
Why do pumps fail?

- Incorrect application
  - Most pumps used in our industry fall into 3 categories
    - Effluent
    - Grinder
    - Multi-Stage
  - Using pumps in the wrong application can cause premature failure
  - We will discuss these pumps and their correct applications
Why do pumps fail?

- Incorrect sizing of the pump and power supply
  - The two most important things when selecting a pump is knowing the required Total Dynamic Head (TDH) and Gallons per Minute (GPM)
    - We will review pump curves and system curves to assure the correct sizing of the pump
  - Power to the pump
    - Pumps like to work within 10% of the nameplate voltage. We will review things that can cause the voltage difference to creep past 10%
Why do pumps fail?

Before you start troubleshooting a pumping system you have to be sure the application and sizing are correct.
What kind of pumps do we use in the onsite industry?

- Effluent
- Grinder
- (Centrifugal & Progressive Cavity)
- Multi-stage
- Sump?
What kind of pumps do we use in the onsite industry?

All these pumps except for the progressive cavity grinder are centrifugal pumps.
Centrifugal Pumps
Effluent Pumps

These pumps are designed to pump grey water and most are capable of passing ½ “ to ¾” solids
Centrifugal Grinder Pumps

These are used to pump raw sewage. They are capable of grinding and pumping most everything that would go down the drain.

Cutter blades at the Inlet of the pump

Pump impeller above cutter blades
Progressive Cavity Grinder Pumps

- Also used to pump raw sewage
- Have cutter blades that grind the sewage
- Impeller replaced with stator and rotor
Multi Stage Pumps

A centrifugal pump with a single impeller that can develop very high head pressures is difficult and costly to design and build.
Multi Stage Pumps

- Used for high head applications
- Very restricted on solids handling

This pump has 9 stages or impellers

Inlet
Motor
Pump & Panel Troubleshooting

• Application
Pump & Panel Troubleshooting

• Was the pump sized correctly for performance and electrical requirements

• It is possible that a quality pump can be installed correctly using ‘best practices’ and still fail

• Troubleshooters should understand the three basics of pumps
  • Application
  • Voltage
  • Performance Curve
Voltages

- 115 volt single phase
- 230 volt single phase
- 208 volt three phase

If you are working on a commercial job be sure you know if the voltage is 230 or 208

230 volts x 90% = 207 volts
Voltages

• Most pump manufactures sell 115 & 230 volt pumps close to the same cost
• Is there a good reason to consider 230 over 115

Maude did you know that 115 volt pumps use less electricity?

She’s ‘busted’ Maude
Voltages

• You purchase electricity by how many watts you use
• Volts x amps = watts
• A 115 volt pump at 10 amps uses 1,150 watts
• 230 volt pumps run on ½ the amps
• A 230 volt pump at 5 amps uses 1,150 watts

YES!
And it should be in your troubleshooting toolbox
Voltages

115 volt pump at 10 amps 250’ from power source #12 wire

8.74% Voltage drop

230 volt pump at 5 amps 250’ from power source #12 wire

2.18% Voltage drop

Measure voltage at the pump to confirm
Performance Curves

- This is a basic performance curve
- The vertical axis is the Total Dynamic Head (TDH) measured in feet
- The horizontal axis is the flow measured in Gallons Per Minute (GPM)
- Each pump has its own specific curve
- Pumps will always operate somewhere on the curve
Remember that a pump will always operate somewhere on the curve……

But there are places on the curve that pumps don't like

Vibration and wear

Cavitation and wear
Pump & Panel Troubleshooting

• Problems to look for
  • No voltage
    • Run the “electricity rope”
  • Low pressure
    • Attach gauge at pump and convert PSI to feet of head
      • 1 PSI = 2.31 feet of head
  • Sized incorrectly
    • Refer to the pump curves
Problems to look for

• Filter plugging
  • Lowers performance of all downstream applications

• Pump runs but no discharge
  • Air locked – drill a 3/16 inch weep hole
  • Impeller has spun off
  • Start torque has unscrewed the discharge piping
  • Check valve installed backwards
  • Discharge pipe uncoupled….Fernco?
  • No operating head in LPP system
Pump & Panel Troubleshooting

• Problems to look for

  • Floats not operating
    • Check for tangled float leads
    • Check for FOG covering the floats
    • Remove floats from basin and activate manually
      • Use your ohm meter
Pump & Panel Troubleshooting

• Electrical problems to look for
  
  • Wrong voltage
    • Measure voltage at source and at the pump
  
  • Wrong amperage
    • Use amp probe to measure amperage pump is drawing
      • Amperage tells you how hard the pump is working
  
  • Supply lead has been compromised
    • Use your ohmmeter to test continuity
      • What about a “Megger”
Pump & Panel Troubleshooting

• Electrical problems to look for
  • Is the breaker engaged
    • Did the homeowner turn the breaker off
    • Did the last service technician forget to turn it on
    • Did something in the circuit trip the breaker
Pump & Panel Troubleshooting

- Electrical problems to look for
  - Tripped breaker
    - Is the circuit overloaded
    - Dedicated circuit is always best practice
    - Has the breaker become weak
  - Is there a GFI in the circuit
    - A Ground Fault Interrupter will trip the circuit detecting a fault of 5 milliamps (0.005 amps)
Pump & Panel Troubleshooting

• Control panel problems to look for
  • Is the panel breaker engaged
  • Check the HOA switch
    • Hand – Off – Automatic
  • Are the relays closing when power is sent to the pump
    • Engage relays manually…If pump gets power suspect the relays
Pump & Panel Troubleshooting

• Control panel problems to look for
  • Is there any sign of discolored insulation on the wiring
    • A sign of heat...resistance
    • Are all leads landed on the correct lugs...and are they tight
  • Has the panel fuse blown
  • If equipped with a capacitor starter is it engaging
    • Usually only found on larger pumps
Pump & Panel Troubleshooting

• Control panel problems to look for

  • Remember there are generally 2 circuits in a panel
    • One that runs the panel and one that runs the pump
    • These should be separate circuits from the power source

  • Are the float leads installed correctly
    • Identify each float and manually operate and observe
    • Use your ohmmeter when testing floats
    • Are signal floats being used as load floats and vice versa
Pump & Panel Troubleshooting

- Time dosed control panel
  - Time dose panels have all the equipment to check that a regular panel has with the addition of a timer
    - If it is an analog timer confirm the settings…This is not difficult
Pump & Panel Troubleshooting

• Time dosed control panel

  • Time dose panels have all the equipment to check that a regular panel has with the addition of a timer

    • If it is a ‘programable logic computer’ (PLC)…It can be more difficult
Pump & Panel Troubleshooting

• Time dosed control panel

• Remember your phone (and camera) and ask for help from the manufacturer. All the front line panel suppliers have technical help personnel that are happy to help…and they are used to pictures…
Pump & Panel Troubleshooting

Always approach a control panel assuming it is ‘hot’

What is electricity always looking for?

GROUND

Don’t be the one that shows it the way!!!
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Questions & more information

tom@residentialsewage.com
Pump & Panel Troubleshooting

• How hard is the pump working?

  • Measuring the amp draw with your amp meter will tell you if the pump is working harder than it should – or not as hard as it should

  • Find a place where you can clamp your amp meter around the hot lead going to the pump to read the amp draw
Questions?