Case Study #3 – Two Vertical Systems Side-by-Side

Install Date – 5/13/2024 (Re-Install)

Manufacturer – Rheem - Vertical Systems - Two different Sizes – Located in an "AC Room" – AC Powered – Condensate pumps on both units - Dispense interval seven days.

Background: Both systems were moved from the attic into a small "AC Room" within the house.

These systems clogged over the years, and I installed a Zoog Zapper on both. A few months later the homeowner decided to move the AC systems out of the attic because of all the previous problems. I went back to re-install both Zoog Zappers. Both AC systems were installed vertically and both systems required condensate pumps as a pump is the only way to expel the condensate.

The homeowner hired an Air Conditioning Engineer to help with the design of the AC systems. The engineer told the homeowner that since the systems have been moved down out of the attic, the Zoog Zapper systems would no longer be needed. The engineer instructed the homeowner to pour a cleaning solution into the cutoff switch monthly (which flows into the drain pan) which she did for the last three months. So ideally there would be a minimal amount of bacteria currently in the system.

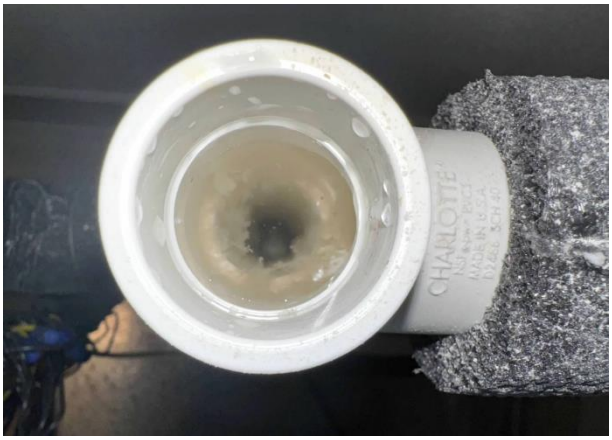
I started with the smaller of the two systems.

Both systems had traps made from 90-degree PVC elbows. (good (there is actually a trap) – and bad as 90-degree elbowss are prone to clog. A "P-Trap" should have been used)

After the trap was a vent pipe. (good).

The trap is necessary for the condensate to exit the drain pan, the vent pipe provides air flow to allow the condensate to flow unimpeded to the pump.

The PVC piping on both systems could be removed to be cleaned (good), and to be able to pull out the condensate pumps for cleaning and servicing.



I removed the vent pipe and looked into the Tee fitting – and saw some Zoog.

I put the vent tube back on and vacuumed out the drain piping.

The result.

A fair amount of Zoogloea.

I removed the drainpipe on the pump, and I looked in the hole in the pump housing.

The white stuff is extremely healthy Zoogloea floating…

I opened the pump housing. There is Zoogloea all over the pump housing and within the tank.

I vacuumed out the pump and cleaned the Zoog with paper towels.

The tank has a solid film stuck on the bottom and sides.

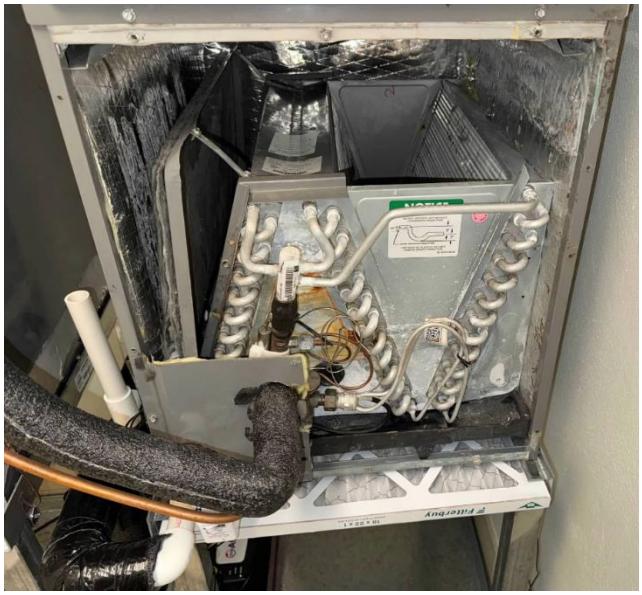
I am including these pictures to highlight that condensate pumps absolutely will harbor Zoogloea.

The second pump looked exactly the same as this first pump.

This document will be update in 3 months (today is 5/16/2024) to present how well the Steramine performs. Both systems are set to pump every seven days because of the pumps. The problem with pumps is they will pump often during normal use, so the Steramine does not have much time to sit in the tank, The Steramine needs to mostly kill the bacteria on contact.

So as far as the Zoogloea not growing in these AC units just because they were moved from the attic to downstairs, that was clearly proven wrong. The drain troughs, PVC piping and the pumps on both systems all had Zoogloea growing readily – even with a monthly treatment by the homeowner…

Installation Time!



This is the smaller system.

I pulled the disconnect at the top of the unit to turn off power. There were no UV lights in the unit to be concerned about **(do not look at UV lights, they will burn your retinas!)**

The coil configuration is an “N” where two coils are connected together and share a common drain trough.

There is a second tall vertical drain pan on the left side of the left coil which was used when the unit was mounted horizontally in the attic. This second drain pan now has no purpose when the system is mounted vertically.

The entry point for the tubing will be the spare drain port (on both systems).

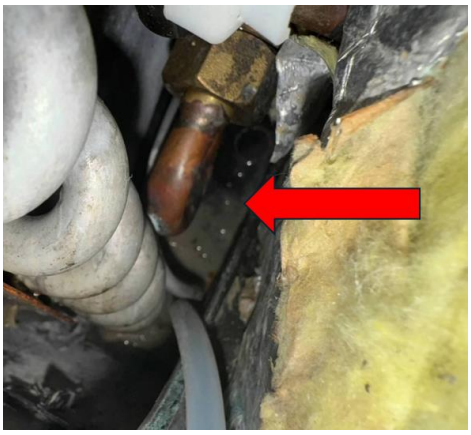
This is the ideal entry point for an AC system because the Combo Fitting is specifically designed for these spare drain ports.

The red plug is removed.

The stationary panel was loosened to have more access to lower the 380MM (15”) tube down behind the stationary panel to line up with the outlet hole.

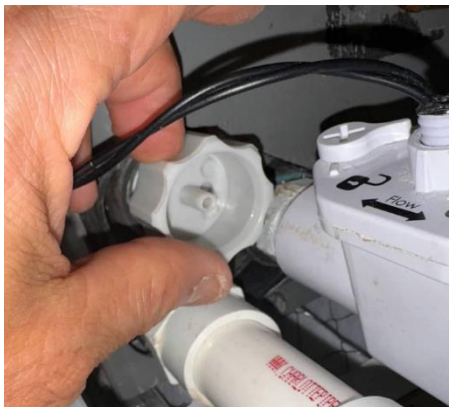
BTW, looking at this picture, there is Zoogloea growth in the drain pan at the outlet hole (red arrow).

Oops – I did not see this.



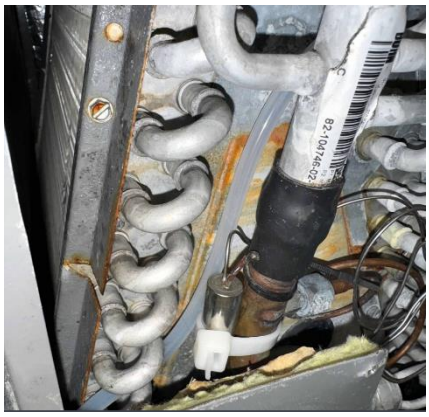
If I did notice the Zoog I would have cleaned out the drain pan…

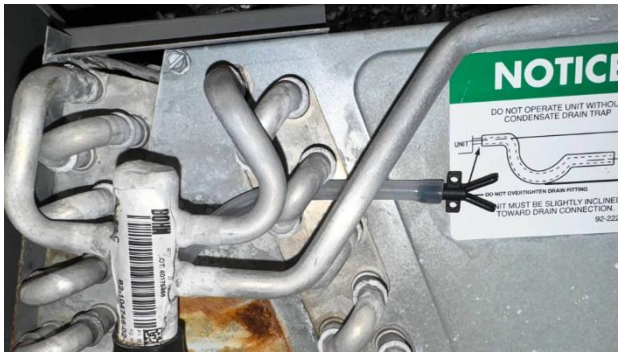
The tube was lowered down to the hole (left picture) and the tube is pulled out with a needle-nose pliers (center picture). The tube is attached to the Combo fitting on the threaded side of the fitting. (right picture)



The combo fitting is inserted into the drain outlet hole.

The dispense tubing is next checked for any twists/kinks and is routed through the tubes of the coils (right) and brought to the center of the coil.





The Two-Port Manifold is connected to the dispense tubing.

Next, the Zoog Zapper was placed on the upper panel, left side, because this is the side the copper tubing enters the cabinet.

The system is normally placed on the upper panel as the lower panel is removed for servicing and there are no interferences with the Zoog Zapper on the upper panel.

If the upper panel needs to be removed, the Zoog Zapper system is easily removed.

The dispense tube is routed to the side of the cabinet so the tubing does not interfere with the lower panel.

The tubing is routed down the side of the cabinet and connected to the Combo Fitting.

Make sure the tube is inserted all the way onto the fitting tube nozzle.

Nozzle Placements

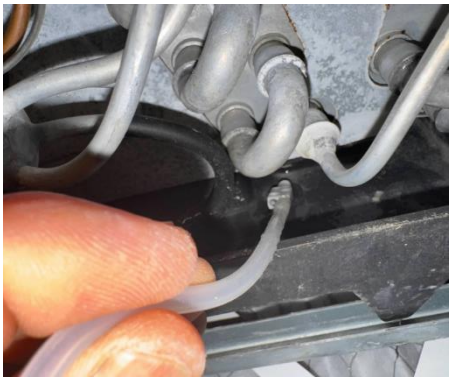
The Single-Port Nozzle was selected to be used on the left coil.

Since there is a second vertical drain pan there is no concern about placing the nozzle in the far back corner because entire coil is contained within the drain pan.

On this system I could reach in by hand and flip the nozzle (red arrow) into the far back corner.

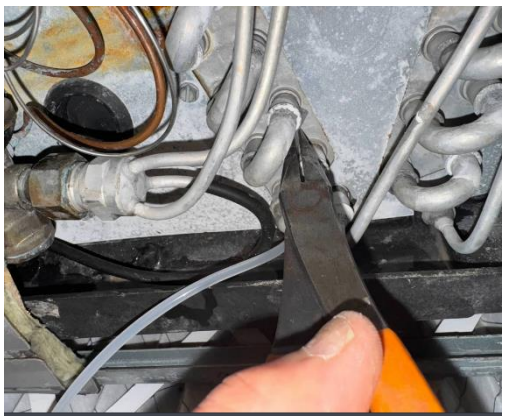
The tube was threaded through the AC coils and connected to the Two-Port Manifold.

A Single-Port Nozzle is also going to be used on the right-side coils. The placement location could be placed in either of two locations, under the coil directly in the trough (left) or on the top of the coils (right) down inside the "V" at the far back.



The two right coils share a common drain trough so either location can be used. I decided to go under the coil instead of routing the tubing up over the front plate and then back down to the back of the "V."

The nozzle slid in easily by hand, so the placement wire was not needed.



The 4mm dispense tube was threaded through the coils using the needle-nose pliers (easier with a pliers) and then the tube was connected to the Two-Port Manifold.

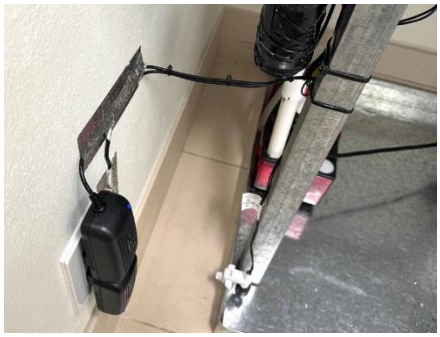
Wire ties were used to loosely hold the Two-Port Manifold to the tubing and to secure the dispense tubes to the coils.

Tubing routing is now complete.

A final check underneath the coil is required to verify that the dispense tube which was placed in the trough directly did not pop out of the trough. The picture on the right shows the common trough looking up from underneath where the filter goes. It would be obvious if the tube and nozzle popped out of the trough. If that should happen, redo the insertion.

Nozzle placement is complete.

Next, connecting power. For these systems, an outlet was available and both AC Power Adapters were plugged in. The power adapters (and the AC units) are behind doors and are not readily visible.



Aluminum tape was used to secure the wiring to the wall, and both aluminum tape and wire ties were used to secure the two power cables routed up to both pumps. The two cables were threaded through the two support frames to the pumps.

Neatness counts when running the cables!

At this point, the first system is ready for the reservoir to be filled with hot water. The reservoir should be filled to the bottom edge of the lid flap, not all the way to the top. There is a vent plug in the lid that needs to "breathe" so the water is to be below the vent. After pumping the initial dose of two cups of Steramine the reservoir can be "topped off" to gain additional volume.

Once the reservoir is filled and in place, verify the quick disconnect is tightened securely. If the fitting is loose, air will be drawn into the fitting and no liquid will be pumped. *This is a link to a video showing how to connect the fitting - Quick Disconnect Fitting Installation).*

The Steramine packet was added to the reservoir. Forty (**40**) tablets of Steramine are used.

The push button is pressed **two** times. A sequence begins where the pumps runs in reverse for seven minutes and air is pumped into the reservoir to help the tablets dissolve and mix the solution. Air bubbles will be ejected from the internal dispense tube into the water.

After seven minutes, the pump will reverse and pump two cups of Steramine to flood the system with a high dose.

Once the pumping is completed, the level of water in the reservoir can be topped off by adding additional water. Add water until the water level reaches the bottom of the lid flaps.

If the dispense interval is to be changed, that should be done now. The default setting is every fifteen days. The manual details how to change the interval and suggestions on selecting an interval.

In this case, both units were set to dispense every seven days due to having the two pumps and observing an overall relatively high amount of bacteria, even with the homeowner adding a chemical monthly. Both systems were problematic in the attic (before the Zoog Zapper was added) and the assumption is the will be problematic still especially with the addition of the pumps.

Time will tell how well the Steramine prevents bacterial growth!

At this point, the first system is complete, the AC system was turned back on.

Second system install.

This second system was also a Rheem, but larger.

The coil configuration was the same "N" design, so the nozzle placements were done the same way.

The Combo fitting was used as there was a spare drain port.

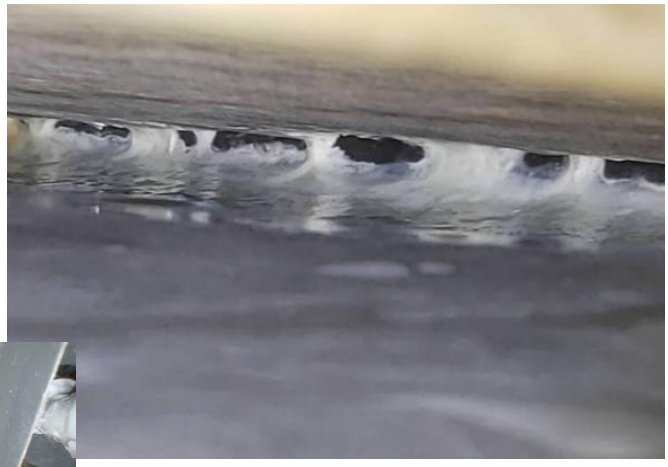
This system also had a “clump” of bacteria growing at the drain outlet. Eventually the drain port would have clogged.

The front trough also had a film of bacteria growing.

All the bacteria was cleaned as well as the condensate pump.

Paper towels and a Ziploc bag for trash are good to have on an installation.

As a sidenote, when this system was in the attic mounted horizontally, there was a large amount of bacteria growing from the drain trough up to the coils (below picture)! The bacteria was difficult to manually remove, and I did the best I could before installing the Zoog Zapper. From that point on the Steramine prevented the growth, and then the Zoog Zapper was removed as the systems were being moved down into the “AC Room.”



This right picture is the same trough, which is now vertical. There is a feint white line at the bottom center of the picture. That line is the dead bacteria from the previous picture.

These pictures show why dispensing into the interior of the drain pan is critical to avoid blockages. Just dispensing into the external drainpipes is only half of the solution.

The second system was completed and both systems will be checked in three months to see how well the pumps are sanitized. Based on past experience and testing, the drain troughs will be clean.

The completed installation (the doors were put back on):

Total installation time 2.5 hours.

Over one hour was spent cleaning the pumps, drain lines, and drain pans.