Step by Step Trouble-Shooting Guide

This procedure has been written with the idea in mind that a retail customer has just returned a system to a distributor's location and is asking for an immediate replacement, or repair. By following this guide you should have sufficient information to determine the cause of the customer's complaint and provide the correct solution. We tried to keep this guide as simple as possible and avoided using technical terms. We also start the guide with a visual inspection then proceed to more-involved troubleshooting, which requires dismantling some parts of the system.

Eliminator 90 RO (See Page 5 for the 180 GPD system)

Low Water Production

The most common complaint from your customers will be a low product water flow rate from the RO system. There are two local causes for this condition: low water pressure and/or low water temperature. The next common cause for low production will be a clogged sediment and/or carbon pre-filter. The least likely cause of low production is a fault with the RO membrane. By following the step-by-step procedures listed below you will be able to determine the cause of the customer complaint.

The Following Tools are Required for Testing:

1- Operations Manual for the RO System
1- Measuring Cup or Graduated Cylinder in milliliters
1- In-line Thermometer
1- Pressure Gauge Kit (PGK)
1- Chlorine Test Kit (TK-CL-25)
1- Conductivity Tester (TS-T61 or TS-T71)
1- 90 GPD Flow Restrictor (FR- 90)
1- 180 GPD Flow Restrictor (FR-180)

Visual Procedure

1 - Check the Location of the Product and Wastewater Lines

The easiest means of differentiating between the Product water port and the Wastewater port of the RO membrane housing will be to locate the injection-molded stem that protrudes from the base of the Product water port. This stem is clearly visible in the Owner's Manual and by visually inspecting the output end of the membrane housing. (Also, most of the newer membrane housings have a BLUE retaining ring on the Product water port and a YELLOW retaining ring on the Wastewater port).

Note: Tubing may be disconnected by holding down the retaining ring with your thumbnail and pulling the tube straight out with your other hand. When you re-insert the tube, be sure the end seats firmly into the bottom of the fitting and cannot be pulled out by hand.

If the BLUE and YELLOW tubing are in the proper locations, continue to Step # 2.

If the BLUE and YELLOW tubing are reversed, you have found the problem.

Solution: Reverse the connections of the blue and yellow lines. Be sure the Flow Restrictor is in the YELLOW tubing.

2 - Inspect the Black Tubing between the Carbon Pre-Filter and the RO Membrane Housing

If the tubing is in good condition, continue to step # 3. If the tubing is pinched or deformed in any way, you have found the problem. **Solution:** Replace the tubing.

3 - Check the Flow Restrictor

Remove the yellow tubing from the RO membrane housing. Look in the end of the yellow tubing.

If the Flow Restrictor is inside the end of the yellow tubing continue to step # 4.

If the Restrictor is missing, you have found the problem.

Solution: Install a new Flow Restrictor.

4 - Inspect the Flow Restrictor

Remove the Flow Restrictor from the yellow tubing. One end of the capillary tube is bonded to a plastic insert. Inspect the bonding material for voids between the capillary tube and the plastic insert.

If the bonding material has developed a void or the capillary tubing is missing, you have found the problem.

Solution: Replace the Flow Restrictor.

Inspect the internal diameter of the capillary tube. The ends of the tubing should have clean cuts without burrs at either end. The internal diameter should be open throughout the length of the tubing and you should be able to blow a slight amount of air through the tubing.

If the tubing is deformed, if either end has burrs, if a particle or a foreign substance is blocking the internal diameter of the tubing, or if the tubing was crimped, you have found a problem that may have permanently damaged the membrane.

Note: Inform the customer that the membrane can be easily damaged if any of these conditions existed for even a very short period of time.

Solution # 1: If the tubing has burrs or is crimped near the end:

Cut off the damaged end of the tubing with a sharp razor blade or Exacto blade at a 45 to 60 degree angle, then re-install the Flow Restrictor into the yellow tubing and insert the yellow tubing into the waste water port on the RO membrane housing.

Solution # 2: If the capillary tubing is damaged beyond repair, replace the Flow Restrictor.

Testing the System

You are now ready to start testing the system for the proper flow rates from the product and waste lines and to determine the condition of the sediment and carbon pre-filters and the RO membrane.

1 - Prepare System for Testing

Insert the "tee" of the Pressure Gauge Kit between the "OUT" of the carbon filter and the "IN" of the RO membrane housing. (If an Auto Shut-Off Valve has been installed on the unit, insert the pressure gauge kit between the "OUT " of the ASO and the "IN" of the RO membrane).

Attach the input line of the system to a water source that has the In-line Thermometer installed.

Slowly turn on the water until the water supply valve is on full (< 80PSI).

Allow the air to bleed from the system for a few moments.

Record the water temperature. **(_____)**

Record the water pressure reading on the pressure gauge. **(_____)**

This would also be a good time to test for chlorine leakage through the carbon pre-filter. Use the Chlorine Test Kit, which is accurate to < 0.2 PPM. If "any" level of chlorine is present in the wastewater stream the RO membrane could have been damaged. The carbon pre-filter will need to be replaced after testing is complete and possibly the RO membrane. (This test assumes that you have a chlorinated water source).

Turn off the water. Allow the pressure to bleed off. Unscrew the sediment and carbon pre-filter housings and remove both filters. Re-install the empty housings.

Note: All of the remaining tests will be performed without the pre-filters installed!!

2 - Testing the Condition of the Pre-Filters (Calculating the % of Pressure Drop)

Slowly turn-on the water until the water supply valve is on full (< 80PSI).

Allow the air to bleed from the system for a few moments. Record the water pressure reading on the pressure gauge. **(_____)**

Compare the water pressure before and after removal of the prefilters.

Divide the pressure reading after the filters were removed by the pressure reading before they were removed. Subtract 1 from the result then multiply by 100. [((P_{after} / P_{before}) - 1) X 100] This is the percentage of pressure drop across the pre-filters. If the pressure reduction is greater than 15%, both of the pre-filters should be replaced, <u>after all testing is completed.</u>

(This would be a good opportunity to educate the customer on the benefits of having the Pressure Gauge Kit (# PGK) permanently installed on their RO system. If it is suspected that the customer has low pressure, a Pressure Gauge Kit **plus** a Booster Pump (# BPHF-MO-115) will be required for the proper operation of the system).

3 - Test the Membrane Flow Rate

We are now ready to check the product and wastewater flow rate from the RO membrane. After completing the pre-filter tests, the tap water should still be turned "on" and the pre-filters removed from the system.

If you are confident that the existing Flow Restrictor is in good condition and has passed your prior inspection and testing, you may continue to the next test. If the condition of the Flow Restrictor is suspect, we would recommend removing the customer's Flow Restrictor and installing your test restrictor that was supplied for this test.

With the water on full (< 80 PSI) measure the water volume from both the waste and product lines individually for one minute each.

Measure and record the Milliliters per Minute from the Product line. **(_____)**

Measure and record the Milliliters per Minute from the Wastewater line. **(_____)**

At this point in our testing we will not concern ourselves with the Wastewater volume. You may use the existing restrictor if the Wastewater flow is in a range between 300 milliliters per minute at 40PSI @ 50F and 950 milliliters per minute at 60PSI @ 77F.

For the purposes of this test, we would expect that most systems will be used under average conditions at approximately 50 PSI @ 60 F. If your conditions are close to this assumed average condition, we would recommend using an FR-90 Flow Restrictor cut to approximately 8 inches total length for this test.

Note: If the Wastewater volume is less than 4 times the Product water volume (using the customer's original Flow Restrictor), the membrane may have been damaged due to insufficient Wastewater flushing effect caused by improper adjustment of the Flow Restrictor. Inform the customer that operating the system at less than a 4 to 1 ratio will cause premature fouling of the membrane and a loss of water production. This condition will also void any warranty on the RO membrane. (Before recommending a membrane replacement, complete the test procedure).

4 - Proceed to the "Membrane Output Calculation Guide" in the Owner's Manual

The result of your calculations will show the "Expected" GPD production rate from the system after taking into account the water temperature and water pressure variations.

Unfortunately, most customers will not be aware of the effects that water pressure and temperature have on RO membranes. It may be necessary to explain the calculations to the customer at this time. If the "expected" GPD production rate is within 15% of the actual flow rate, the membrane is considered to be in "good" condition.

This completes our inspection of the system, pre-filter diagnostics and the "expected" flow rate calculations.

If the customer's questions relate to product water purity, continue to the following section.

Water Purity

1- Tools Required for Testing

Conductivity Tester, TS-T61 or TS-T71

Before proceeding with the following test procedure please follow all of the previous test procedures and verify that the water pressure is adequate. Also confirm that the conductivity tester is calibrated correctly and is in good working order. (See the owner's manual for the tester.)

Allow the system to operate for 10 to 20 minutes without interruption and verify that the pressure is greater than 40 PSI. Direct the product and wastewater streams to a drain.

Most TDS testers include a reservoir cap for retaining the water that is to be tested. Be sure the reservoir is clean by rinsing it thoroughly at least three times with the product water as it drips directly from the product water line, before attempting to take the conductivity reading. After filling and discarding the water three times record the reading. **(_____)**

Turn on a tap water faucet and let it run for a minimum of 30 seconds. Follow the step above and record the conductivity reading. **(_____)**

2 - Calculate the Percentage of Rejection

Subtract the RO product water conductivity (X) from the tap water conductivity (Y). Divide the result by the tap water conductivity (X) then multiply by 100. This is the % of rejection from the RO membrane.

[((X - Y) / X) x 100]

Under normal water conditions and at 60 PSI water pressure, the expected rejection rate from a new RO membrane should be greater than 97%, although there are several other factors that may affect the TDS level of the product water.

For example, if soda lime softening (Calcium Hydroxide) is used in the municipal water supply to raise the PH, a high percentage of OH will pass through the membrane and cause the conductivity to be higher than normal in the product water.

There are many factors that will affect the operation and rejection characteristics of an RO system. A few among many are: hydrogen sulfide, iron, bacteria, excess hardness, very low or high PH, ammonia, tannins etc. If you are still in doubt after completing all of the test procedures please call the SpectraPure Technical Support Line at **1-800-685-2783, Ext 2.**

Eliminator 180 RO

The Eliminator 180 GPD System incorporates two 90 GPD RO membranes. All of the previous steps used for evaluating the 90 GPD systems are valid in this procedure except for the items listed below. You will be testing the product water rate for each of the RO membranes independently in order to determine their condition. The membranes are in series with the wastewater from the first membrane feeding the input of the second membrane. You will need to remove the product lines from each membrane housing and test the individual conductivities in accordance with the **Water Purity** paragraph above.

1 - Testing Conductivity for 180 GPD System

After the system has been operating for 10 minutes or more, remove the blue product lines from each membrane at the "tee".

Follow the instructions under the **Water Purity** paragraph above.

Record the numbers and calculate the results. If either membrane has a rejection rate of less than 94%, we would recommend replacement of the membrane.

Reconnect the product lines.

2 - Test the Membrane Flow Rate

After the system has been operating for 10 minutes or more, remove the blue product lines from each membrane housing.

Follow the instructions under "**3 - Test the Membrane Flow Rate"** above and measure the product rate from each membrane independently.

Each of the membranes should be within 15% of the "Expected" GPD flow rate. If either membrane were below the expected production rate, we would recommend replacing that membrane.

Technical Support