User Instructions

THE RO BUCKET LLC
Practical, Portable Reverse Osmosis

RB5, RB10, RB15
Maple Sap Buckets

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Revision 2

Responsible Use and Liability Disclaimer

The products offered by The RO Bucket LLC are intended for use by individuals who have become knowledgeable regarding the reverse osmosis process as it relates to maple syrup production. **Follow all indications and directions and observe reasonable care when utilizing this product.** Possible hazards associated with the use of the product include, but are not limited to:

- Shock/Electrocution - Always use a ground fault outlet and surge protector. Always wear shoes and keep electrical cord away from wet/moist surfaces. Always run discharge hoses into containers. Never allow them to spill onto nearby surfaces.
- Fire - Do not use the product in potentially explosive, flammable, or corrosive environments. In the event the thermal protection function is enabled, unplug the unit and wait one hour before using again. Do not disassemble or alter the motor or driver. Use only the provided transformer.
- Physical hazards - The product works under high pressure. Always wear safety goggles and point hoses away from your body and face.
- Leaks – Closely monitor the operation of the product. Regularly inspect and repair any components that are leaking.

In no event shall The RO Bucket LLC be liable for any direct, indirect, punitive, incidental, special, or consequential damages to property or life whatsoever arising out of or connected with the use or misuse of our products.

The RO Bucket – User Instructions

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1. Introduction to RO for tree sap

The pre-treatment of tree sap through reverse osmosis has been revolutionary in the syrup industry. The ability to remove large amounts of water prior to boiling greatly reduces the amount of time and energy required to make syrup. The RO Bucket is specifically designed for smaller scale maple producers. As you begin planning your first batch of syrup with your RO Bucket, consider:

a. Pre-concentrating sap before you boil – If your boiling rate is greater than your RO Bucket's processing rate, you should concentrate some sap ahead of time so you don't run out during your boil. The amount you need to concentrate will depend on your boiling rate and the capabilities of your RO Bucket. An example scenario is outlined below:

   You want to boil for 8 hours and you boil at 5 gallons per hour. You have an RO Bucket that will process 7 gallons of sap per hour, making 3.5 gallons of concentrate per hour. Since you will boil 40 gallons of sap for this session, and will only make 28 gallons of concentrate if you run the RO while you are boiling, you will need to have 12 gallons of concentrate on hand as "make up sap" during your boil.

b. Batch size – The darkness and flavor of maple syrup, in part, is a result of the long boiling process required to make it. When utilizing reverse osmosis, it is important to remember that you will not be boiling your syrup as long. These shorter boils tend to produce syrup that is lighter in color. While this is generally a good thing, a boil that is too short may not allow certain compounds to break down properly. "Metabolism off-flavor" is a characteristic of syrup that is not boiled long enough. It has a butterscotch smell and gives the syrup an astringent flavor. If you are experiencing any unfavorable smells or flavors, consider doubling your batch size. This will ensure adequate boiling time and will help maintain good syrup quality as it allows any negative compounds to break down.

c. Permeate liquid (pure water) – The importance of properly maintaining your RO should not be overlooked. The RO needs to be flushed with permeate water after every use and a strict flushing schedule should be followed to ensure maximum efficiency and prolonged membrane life. Plan on saving at least 10 gallons of permeate water every time you use the machine. Permeate water has a shelf life of two days. If no permeate water is available for flushing, non-chlorinated water can be used (distilled water, spring water, or well water).

2. Diagram of The RO Bucket

1. Bucket
2. Separator Plate
3. Booster Pump
4. Transformer
5. Water Filter Housing
6. Membrane Housing(s)
7. Needle restriction valve
8. Intake (suction) hose
9. Permeate (water) outlet
10. Concentrate (sap) outlet

Note

Fittings should be removed and re-sealed with Teflon tape if there is significant leakage (see directions in **4. System Maintenance**). Tiny drips (amounting to less than one cup per hour) are normal and do not need immediate repair.

3. Instructions for sap processing/water removal:

The RO Bucket generally comes ready-to-use out of the box. Unpacking involves removing the 110v transformer, intake suction hose, membrane preservative, extra pre-filter, any accessories purchased, and packing material.

The 5 micron pre-filter and membranes are already installed in their corresponding housings.

Initial setup and startup is described below.

1. Place the 3/8” plastic intake hose into the 3/8” intake bulkhead fitting on the outside of the bucket. Make sure the intake hose is fully inserted into the bulkhead fitting (It should go in a full ¾”). Place the other end of the intake suction hose in the sap you would like to concentrate. **(Note: The intake hose should not exceed 5’ if drawing from a container, and should not exceed 15’ if drawing from the valve on the bottom of a tank).**

2. Plug the 110v transformer into the power jack fitting on the outside of the bucket.

3. Place the two (permeate and concentrate) outlet lines into the same bucket as your intake suction hose.

4. Plug the 110v transformer into a grounded GFI outlet.

5. Sap will begin to saturate the system. Once sap is flowing out of the concentrate hose without any air bubbles, you can begin water removal.

6. Turn the needle valve clockwise slowly until the stream of sap is significantly smaller than it was before. In about 30 seconds, the pump will begin getting louder and pure water (permeate) will begin to flow out of the other ¼" (RB5) or 3/8" (RB10 and RB15) hose (permeate hose). If you cannot reduce the concentrate flow to achieve 50/50 flow, make sure the backing nut on the needle valve is not hindering operation. Also, make sure the needle valve is correctly installed (The arrow on the side should be pointing towards the discharge side of the hose).

7. Adjust the needle valve so that both streams (concentrate and permeate) are flowing at the same rate. An equal rate of discharge from both hoses will mean you are removing 50% of water from your sap, or doubling the sugar concentration.

   Note
   At no time should the flow of concentrate be less than the flow of permeate. This could result in rapid deterioration of the reverse osmosis membranes.

Higher sugar concentrations (up to 8%) can be achieved by running existing concentrate through the system in a subsequent pass.

4. System Maintenance

The consumables in the RO Bucket have varying life expectancies. Many factors, including sugar concentration, sap quality, temperature, and time, can all affect the replacement intervals for pre-filters and reverse osmosis membranes. The following general guidelines should give you an idea of how frequently you should be replacing these items:

Pre-filters – Designed to be a single use filter. Usually needs to be discarded due to bacterial growth. If adequately flushed and refrigerated between uses, can last up to a week. If processing large amounts of sap uninterrupted, change every 300 gallons.

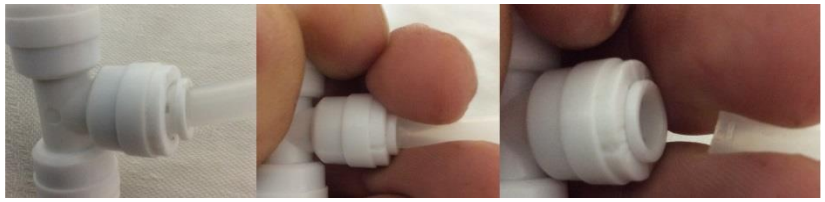
Always replace with a quality, 5 micron or less, 10" pre-filter.

Reverse Osmosis Membranes – Provide adequate performance for up to two years, or 2000 gallons of sap per membrane. Never allow water to flow at a faster rate than concentrate. Membrane life can be prolonged by occasionally running concentrate at a faster rate than permeate water for 30 minutes. Liberal water flushing between uses will also help maintain membrane performance.

Membranes that begin to show performance decreases can be flushed with our membrane preservative according to the procedure outlined in Section 6 "Instructions for End-of-Season Storage". Flush membranes with water for at least 30 minutes (or until the pH of discharged concentrate approaches 7) before processing any sap.

a. How to remove quick connect fittings:

Quick connect fittings, commonly called “push to connect” fittings, feature a movable collar that allows the inserted hose to be easily removed. To remove a hose from a quick connect fitting, simply push the collar against the fitting with one hand. Use the other hand to pull the hose out of the fitting. It should pull out easily. Excessive force could ruin the fitting.



b. Installing/Changing pre-filters:

To install or change a pre-filter, locate the pre-filter housing and remove the two 3/8” hoses from their quick connect fittings. Pull the entire filter housing out of the RO Bucket. Twist the top lid of the filter housing counter-clockwise to remove it. After replacing the filter, replace the lid and insert it back into the RO Bucket. Re-install the two 3/8” hoses into their quick connect fittings.

c. Removing RO membranes from their housings:

To remove RO membranes from their housings, you will need to remove them from the RO Bucket. To do so, remove the two lower hoses from their quick connect fittings. Also remove the top hose from its quick connect fitting. Remove the RO membrane housing from the RO Bucket. Using membrane housing wrenches, twist the lid of the membrane housing counter-clockwise to remove it. (If you do not have membrane housing wrenches, you can use strap-style wrenches found at any hardware store to hold the membrane housing and lid).

Once the lid is removed, pry the membrane out of the housing by inserting a round bar (or Phillips head screwdriver) into the hole in the top of the membrane and pry using the side of the membrane housing.

d. Repairing leaking fittings

Leaking fittings can be easily repaired using Teflon sealing tape. Our housing manufacturers recommend twenty turns of teflon tape to seal plastic fittings.

O-ring style fittings that have developed leaks can be repaired by replacing the o-ring or discarding it and using Teflon tape in its place.

5. Instructions for cleaning unit after sap processing/water removal:

1. If unit <u>will</u> be used within one day:

After processing all of your sap, the unit needs to be flushed with permeate water (RO water) if it is not to be used again within 24 hours. The following procedure should be followed with the needle valve fully open:

a. Remove the 3/8" intake hose from sap and allow unit to run dry (it will begin gurgling and pushing air).

b. Insert 3/8" intake hose into 5 gallons of saved permeate water (<u>DO NOT USE MUNICIPAL TAP WATER OR WATER CONTAINING CHLORINE AS IT WILL RUIN THE MEMBRANES</u>) and recirculate (all three hoses in same container) for 10 minutes. Unplug the unit and keep it full of water.

c. Remove the 5 micron pre-filter, empty contents of filter housing, and leave the prefilter housing open and dry. (Note: the old pre-filter can be saved in the refrigerator for future use).

2. If unit <u>will not</u> be used within one day, but will be used within a week:

After processing all of your sap, the unit needs to be flushed with permeate water (RO water) if it is not to be used again within 24 hours. The following procedure should be followed with the needle valve fully open:

a. Remove the 3/8" intake hose from sap and allow unit to run dry (it will begin gurgling and pushing air).

b. Remove the 5 micron pre-filter, empty contents of filter housing, and install a new pre-filter and reinstall the filter housing. (Note: the old pre-filter can be saved in the refrigerator for future use. The new pre-filter can be reused for subsequent flushes).

c. Place the 3/8" intake hose into permeate water that has been saved from sap processing (<u>DO NOT USE MUNICIPAL TAP WATER OR WATER CONTAINING CHLORINE AS IT WILL RUIN THE MEMBRANES</u>) and recirculate (all three hoses in same container) for 10 minutes. After 10 minutes, remove the intake hose and allow unit to run dry.

d. Place the 3/8" intake hose into 5 gallons of fresh permeate water and run it through the unit. Unplug unit before it runs dry.

e. Remove the pre-filter from the filter housing, empty the housing of water, and leave it open until the next use.

3. If unit <u>will not</u> be used for an extended period of time, but <u>is not being stored for end-of-season</u>.

The unit will need to be flushed according to section 5, step 2 above. In addition, every week it isn't used, you must run 5 gallons of water through it until it is flushed for end-of-season storage (See Section 6 below), or run preservative mixture through the system (see below).

If at any time you notice odors developing, performance decreasing, or for extended period storage, it would be advisable to do a flush with membrane preservative mixture. Do so by mixing our membrane preservative according to the instructions on the bottle and recirculating it through the system for 10 minutes. After 10 minutes, unplug the unit and leave it full of the preservative. Rinse the system thoroughly before continuing to process sap. This may require 20 to 30 gallons of water (or until the discharged concentrate approaches a pH of 7).

6. Instructions for End-of-Season Storage

For end-of-season storage, flush according to “Instructions for Cleaning” section 5, step 2.

After you have completed the flush, prepare 1 gallon of warm water (~80F), and dissolve our membrane preservative in it (as per the instructions on the bottle). Re-circulate the gallon of solution through the system for 30 minutes. After 30 minutes, turn the unit off and let it sit for a couple of hours to a day. After that, pull the intake suction hose and allow the unit to run dry.

Re-insert the intake suction hose into clean water and rinse the system for 2 minutes (approximately 2 gallons).

Remove the pre-filter from the filter housing. If storing a bucket system, leave the lid off and make sure the unit is completely dry (leaving the membranes full of water. Do not let the pump sit in a humid environment during storage.

7. Warranty Information

The majority of components comprising our products are intended to be easily replaceable and relatively inexpensive. It is expected that the user becomes familiar with how the product functions and has the ability to repair broken fittings, hoses, and leaks. Furthermore, the user must perform routine maintenance (filter and membrane changes, routine membrane flushing, etc.).

Membrane fouling, bacterial growth, and unpleasant odors can all develop due to improper maintenance and handling. While membrane degradation is not covered by a warranty, our customer service team will gladly help you determine the cause of such issues and help you improve product performance moving forward.

The booster pump and transformer have a **one-year warranty** from the date of purchase. This warranty covers manufacturer defects. It does not cover damage caused by freezing, submersion in water, or rough handling. It is the purchaser’s responsibility to ship the defective pump and/or transformer back to The RO Bucket LLC along with proof of purchase to be eligible for replacement.