COMMERCIAL

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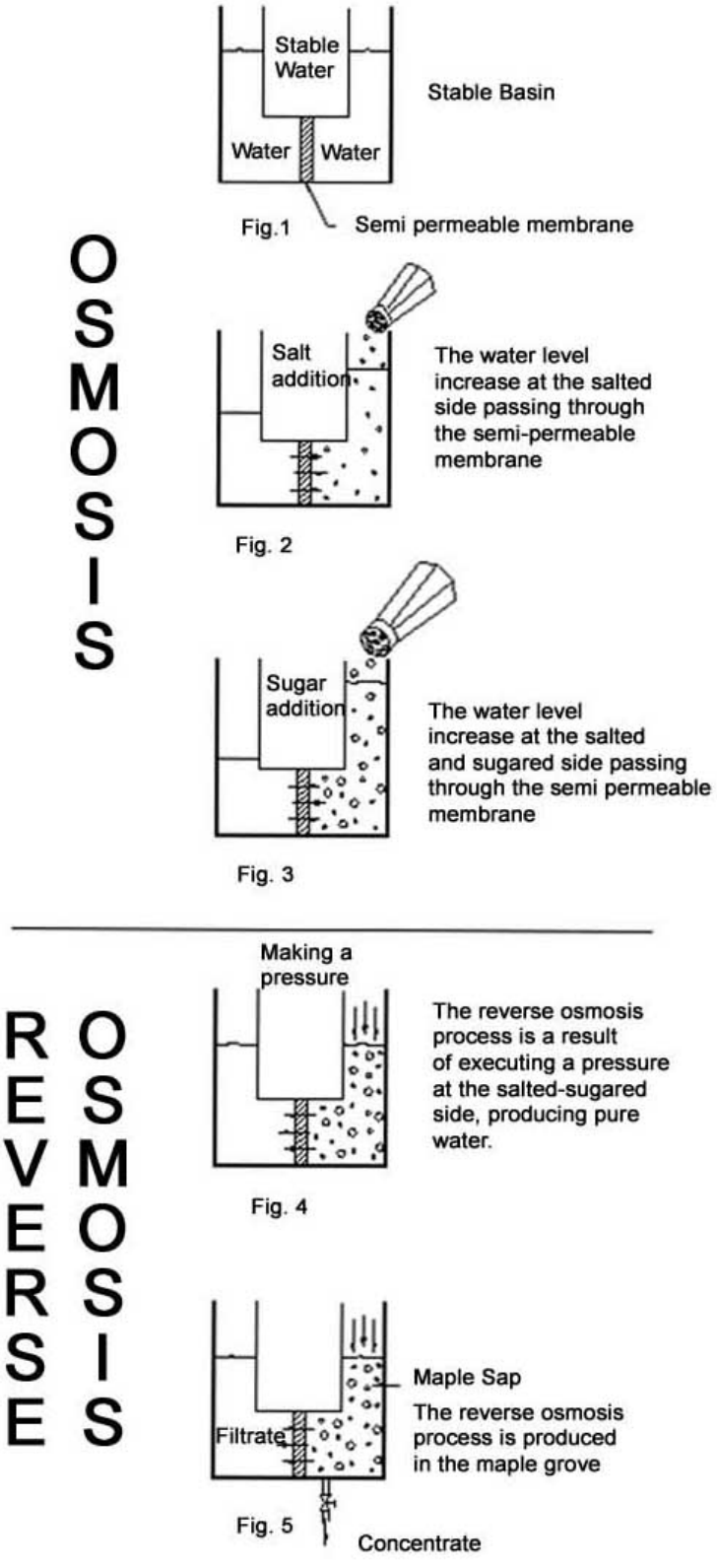


Figure 1. Osmosis and Reverse Osmosis

1.0 USER'S MODE FOR COMMERCIAL REVERSE OSMOSIS

CONGRATULATIONS! You just acquired an LEADER EVAPORATOR reverse osmosis. This proves your interest in new technologies and beautiful things.

In fact, you have purchased a technologically advanced unit built by skilled professionals at **A. Pellerin & Fils Ltée**, who bring many years of research to the use of reverse osmosis in maple syrup production..

1.1 INTRODUCTION :

Reverse osmosis is a process by which a solution's natural tendency to scatter its components uniformly is reversed. It occurs in the reverse osmosis because an applied pressure forces the water through a semi-permeable membrane. The water that does not pass through the membrane is left with all the sugar and thus called the concentrate.

1.2 HISTORY :

The procedure of reverse osmosis was observed and studied since more than 200 years. Abbé Nolet a French scientist had experimented the basic phenomena around 1748. The scientists had figure out after long time, that the natural process could be reversed and many applications could be dispose of in their research. This principle is applied to the process of water desalination since the beginning of the 60's.

1.3 FUNCTIONING :

How this unit works?

This is probably the first question that came to your mind as you opened this manual. The sap provided by maple trees is a solution containing mostly water (96% to 98%), 2% to 3% sugar and small quantities of mineral salts, proteins and other elements such as aroma. Sap is the solution in which you will increase the amount of sugar in relation to the quantity of water. This will be done by extracting the water from the maple tree sap. This separation process will give a more concentrated sap solution (concentrate) and the portion of water which has been subtracted from the sap (permeate).

1.4 PARTS :

Priming pump and Reservoir

All liquid amount inlet that is in the your unit is pumped by the priming pump, whatever, the maple sap that is coming from your reservoir's or the washing solution that is founded in the washing reservoir in stainless steel (CIP) located at one side of the unit.

Figure 2. Priming pump

Figure 3. Reservoir (SS)

Three ways valve

The feeding process is effectuated by the three ways valve (V6) located at the input of the unit.

Figure 4. Three ways valve (V6)

Digital Temperature Display

This controller evaluates the liquid's temperature as it penetrates the reverse osmosis. The value is immediately displayed on a screen located on the reading panel. The temperature must never exceed 49^{o} Celsius (120^{o} Fahrenheit). The programming manual is available inside the reading panel. It works at 50/60Hz, AC100-240, 6.6 VA.

Figure 5. Temperature digital display

Pre Filter:

The sap is filtered by a 10 micron cartridge. This clears it from any substance in suspension. The sump and cap are made of a polypropylene material and the cap includes a Pressure relief valve. Flow rates from 1gpm to 15gpm. Max Pressure: 100psi(6.9 bar). Max Temperature: 100F (37.7C).

Figure 6. Filter and housing

Low pressure control

This control ensures that the filters are not obstructed by dirt or micro-organisms. If such were the case, the machine would stop by itself, thus protecting the pumps and membranes

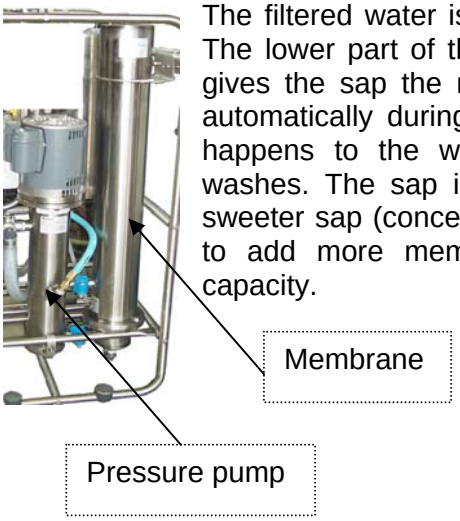
Figure 7. Low pressure Switch

Pressure Gauge

If this is the case, the machine (RO) will stop by itself protecting the pump(s) and the membrane(s). A pressure gauge will allows you to visualize the filter output pressure at the control panel, if the pressure is lower than 12 pds./inch^2 the unit will stop by itself.

Figure 8. Pressure gauge

Membrane and Pressure pump



The filtered water is pressurized with the help of the pressure pump. The lower part of the pump creates what is called recirculation. This gives the sap the necessary speed to clean the membrane surface automatically during the sap concentration process. The same thing happens to the washing liquid during the soap and recirculation washes. The sap is concentrated by the membranes resulting in a sweeter sap (concentrate) and treated water (permeate). It is possible to add more membranes just to increase your reverse osmosis capacity.

Figure 9. Membrane and pressure pump

V2 : Concentrate flow regulating valve

As it comes out of the membrane, the concentrate sets out for the reading panel, reaching a flow regulating valve. The flow will be measured by a flowmeter. You can adjust the concentration percentage by regulating the concentrate flow. The sample valve will allow you to determine the concentration that suits you.

Concentrate flowmeter

This flowmeter calculates the concentrate flow. The value, in gallons per minute (GPM), is indicated on the reading panel

Permeate flowmeter
As it comes out of the membrane, the permeate is run directly through this flowmeter. The flow value is indicated on the reading panel in GPM. During the concentration process, the liquid is directed to the permeate storage basin. It is essential to know the permeate and concentrate flows to calculate the sap concentration percentage. This calculation is detailed in section 3.1 CALCULATION OF THE SAP CONCENTRATION %.

V1 : Concentrate pressure regulating valve
This valve controls the concentrate pressure. The pressure increases as you tighten the valve and decreases as you loosen it.

Pressure gauge (membrane pressure)
It is this gauge which evaluates the concentrate pressure in the membrane. It is possible for you to know the value of this pressure (in psi.) simply by looking on the reading panel.

Permeate sample valve
This valve is located at the top of the permeate V3 valve. You can know if the reverse osmosis process is performed correctly by analyzing the permeate. For example, if the membrane is damaged and therefore not able to retain all the sugar, your permeate will be sweet.

Concentrate sample valve
Located at the top of the V4 valve, this valve allows you to obtain a concentrate sample before it is sent into the concentrate basin. With this sample you will be able to note the difference made by a change of the concentrate flow on the concentration percentage and therefore you will be able to obtain the sweetness you want.

Concentrate basin
After going through the valves, flowmeters and gauges, the concentrate is directed to a storage basin (concentrate basin) to feed the evaporator. The company does not provide you with this basin.

V3 : Permeate direction valve
V4 : Concentrate direction valve
The direction taken by the liquid is determined by the three-way valve position. The black arrows indicate which ways the permeate (V3) and the concentrate (V4) can go.

V19 : Direction valve
This valve directs the water during washing or rinsing only.

Control Box

The unit control is done by the an electric control box, inside this box all the electrical components are included, such as : contacts, timer relay, the temperature control, the positional switches, the fuses, etc.)

Figure 10. Control Box

1.5 INSTALLATION :

All the concentrators of ''**A. PELLERIN et FILS**'' are delivery with a three way valve at the input of the unit. You must provide the couplings for your basin in a way of avoiding a restriction at the time of rising your unit, the waterproofness of the source feeding must be verified in order to avoid the creation of vibrations that will cause a deterioration of the pressure pump and the membrane. The maple sap is therefore conducted by the source feeding pump from the basin just to the unit.

It is recommended to connect the filtrate basin and the maple sap by a common source line, the flow of each basin will be controlled by a valve in each basin or reservoir. This control will be connect directly to the input valve of your unit. It is preferable to place the basin of water sap and filtrate in a way that the liquid pass with gravity. In the unit, all the discharge inconvenient will be avoided in the source line followed by a possible leak over this line.

The return lines for the filtrate and concentrate has to be installed just to the basin or reservoir. It is preferable to be certain that there exist a slope towards the basin for empting complete the lines, specially at evening time with the finality of avoiding freezing effects. This lines, has to be washed, you have to prevent and eliminate the outputs from the lines and basin. A drain has to be installed inside de room where the concentrator is located, this with the finality of evacuate the water need for unit's rising.

A well lit, well heated, well ventilated, isolated shelter for the machine should be planned in the saphouse. The entrance door dimensions must be calculated according to the machine dimensions (see section 5.1). The shelter should be heated prior to delivery and installation of the machine. The durability of the electrical components will depend on the feeding quality. Therefore, it is very important to have your electrician check your installations to make sure that they comply with the local electricity code standards.

2.0 YEARLY START UP :

All the following procedures can be made with spring water (**without Chlorine!**) or well water, as long as it is clean and does not stain.
Your machine has been filled with a glycol solution to prevent the membranes and other components from freezing. The preparation of your system at the beginning of each season must be carried out in the following way:

- Read the user's manual completely.
- Call an electrician to connect the unit to an electrical source.
- Connect the unit to the maple sap, concentrate and filtrate basins.
- Connect the filtrate pipe beneath the membrane
- Plug in the machine and rinse the unit following the same process as for membrane rinsing with half the number of water gallons your unit can concentrate in an hour. For example, if your machine has an 8 inches membrane, thus a 600 gallons per hour (GPH) capacity, rinse it with 300 gallons of water.
- Perform a washing without soap, reaching a water temperature of 46^0C (115^0F).
- Do a second rinsing cycle as soon as the washing cycle is finished.
- .Do a second washing without soap. It is very important to reach the water temperature mentioned before.
- Do another rinsing cycle as soon as the washing cycle is finished.
- Do a third washing cycle, this time adding the soap. Make sure to reach a temperature of 46^0C (115^0F).
- Do a final rinsing cycle with half the number of water gallons your unit can concentrate in an hour.
- Carry out a **permeability test of membranes**
  1. Fill the washing basin just to half of its capacity with filtrate.
  2. Concentrate the permeate at 200 PSI pressure. Returning the permeate and concentrate to the washing basin. To do that, you must position the valves in washing soap cycle, close valve V18 and adjust the pressure to 200 pounds.
  3. Take down a reading of permeate flow when the temperature reaches 13^0C (55^0F). This reading will indicate you the filtration capacity of your membrane only without imply another factor such as temperature, biofilms or bacteria. A permeability test at 21^0C (70^0F) and 150 PSI, will give you the same lecture.
  4. Compare the permeate flow value with the one taken when the unit was manufactured or after you first utilisation during the season. You will evaluate in this way the permeability of your membrane. This data will be your reference for other successive tests.
- You are now ready to concentrate maple sap..

3.0 USER'S GUIDE :

This manual has been designed to help you work with your reverse osmosis. All of these instructions are also printed on the unit. **P.S. TO AVOID BREAKING THE UNIT, MAKE SURE THAT THE PUMPS ARE FILLED WITH WATER BEFORE STARTING THE MACHINE.**

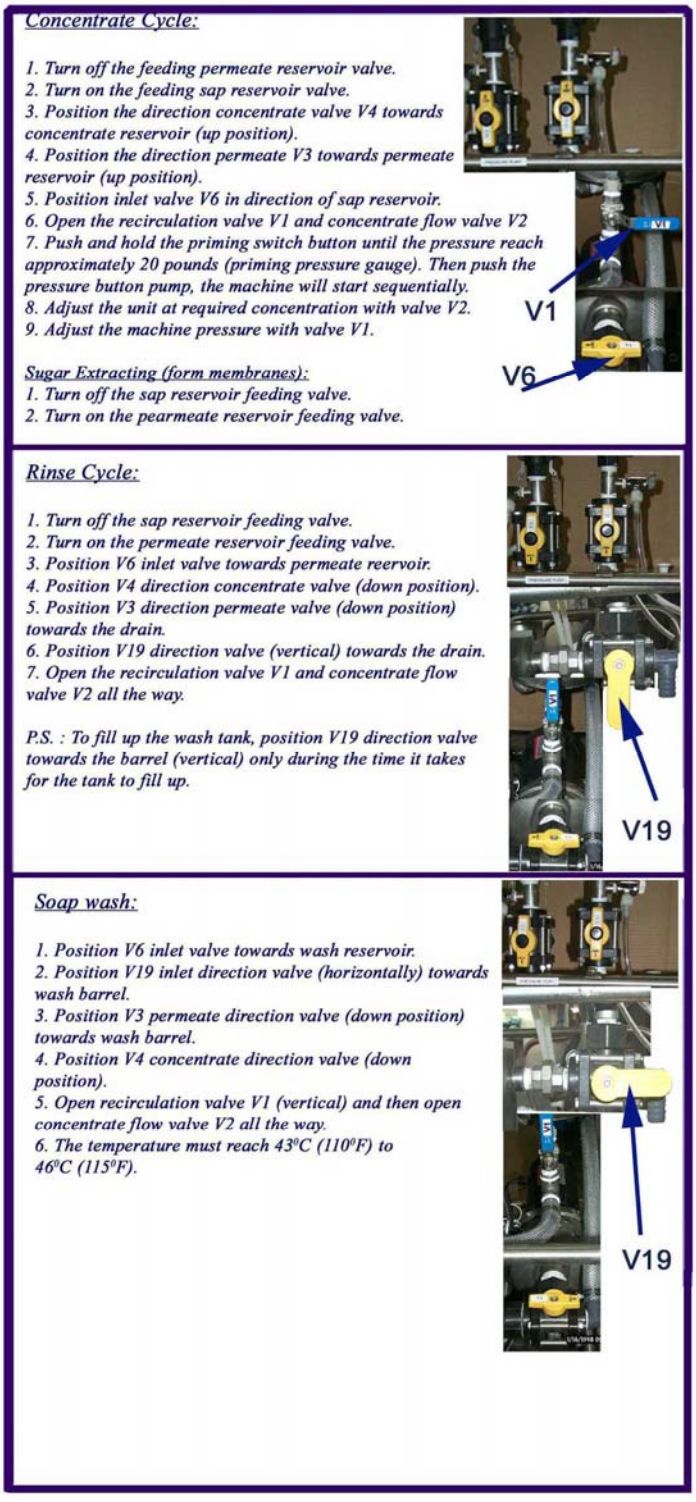


Figure 11. Pictogram

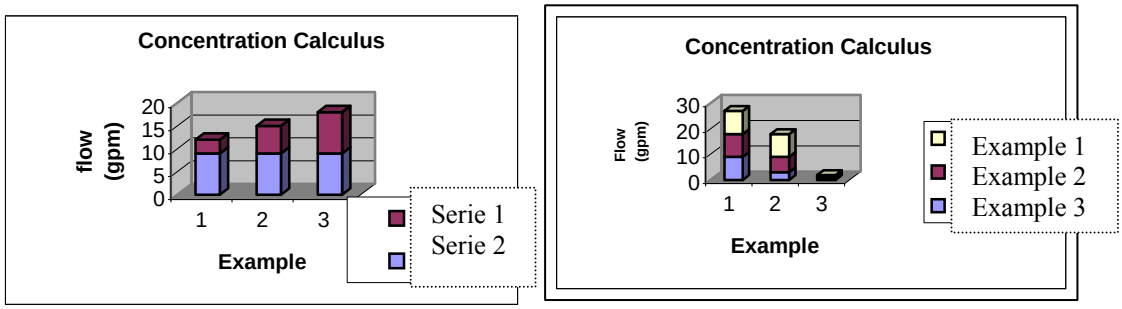
3.1 CALCULUS OF % CONCENTRATION :

The percentage of concentration is calculated in function of the filtrate flow quantity and the total flow quantity that goes in the unit.

Operation data

Date	Density (Brix)		Flow (GPM)		Temp.	Pressure	Concentrate		Conc.
	Sap	Conc	Filtrate	Conc.	Degre F.	pds/inch^2	% de Conc.	Flow GPH	or
1	2	3	4	5	6	7	100x4/(4+5))	60x(4+5)	Test
Example 1	2.0	2.0	9.0	3.0	55	450	75%	720	
Example 2	2.0	5.0	9.0	6.0	55	450	60%	900	
Example 3	2.0	4.0	9.0	9.0	55	450	50%	1080	

Figure 12. Data Results



$$\text{Concentration \%} = 100 \times \left(\frac{\text{(filtrate flow)}}{\text{(filtrate flow + concentrate flow)}}\right)$$

$$\text{Flow per hours} = 60 \times \text{(filtrate flow + concentrate flow)}$$

To facilitate the comprehension, we can take three examples : your unit process 9 gpm in the filtrate and you will like to adjust the concentrate to 3.6 or 9 gpm, what will be the total flow concentration in % of the unit? (Using the data page) given above :

1) Permeate = 9gpm and concentrate= 3 gpm

% of concentration = 100 x ((9)/(3+9))
= 75% @ 720 gallons per hour

2) Permeate = 9 gpm and concentrate =6 gpm

% of concentration = 100 x ((9)/(6+9))
= 64% @ 840 gallons per hour

3) Permeate = 9 gpm and concentrate = 9 gpm
% of concentration = 100 x ((9)/(9+9))
= 50% @ 1080 gallons per hour

IT'S VERY IMPORTANT TO REMEMBER THAT YOU HAVE TO TAKE NOTE OF THE DATA EVERY OPERATION DAY THIS MEASURE HAS THE GOAL OF DETECTING IMMÉDIATELY THE OPERATION DIFFICULTIÉS OF YOUR UNIT.

3.2 MEMBRANE PERMEABILITY TEST:

The filtration process and the membrane's performance vary depending on the type of membrane, exerted pressure on membrane, sap temperature, percentage of sugar in the concentrate, and presence of other components such as bacteria, biofilm and mineral salts. Therefore, it is important to maintain similar test conditions for all samplings. To do so, we recommend that you use the following method:

1. Prepare a basin full of permeate obtained from sap concentration or from clear, detritus free spring water.

2. Rinse machine for 10 minutes with permeate so that only permeate remains inside.

3. Fill the washing basin just to half of its capacity with permeate.

4. Concentrate the permeate at 200 PSI pressure. Returning the permeate and concentrate to the washing basin. To do that, you must position the valves in washing soap cycle, close valve V18 and adjust the pressure to 200 pounds.

5. Take down a reading of permeate flow when the temperature reaches 13^0C (55^0F). This reading will indicate you the filtration capacity of your membrane only without imply another factor such as temperature, biofilms, or bacteria. A permeability test at 21^0C (70^0F) and 150 PSI, will give you the same lecture. You can compare the permeate flow value with the one taken when the unit was manufactured.

6. Compare the permeate flow value from your test (no 5) to the same test made at the factory or when you operated your machine for the first time during the season. You will then be able to establish the exact condition of your membrane.

3.3 ANNUAL CLOSING PROCESS

All of the following procedures can be made with spring water (**without Chlorine!**) or well water, as long as it is clean and does not stain. **Use as much permeate water as possible to store your machine.**

1 Rinse your machine with half the number of water gallons it can concentrate per hour.
2 Wash the machine with the amount of soap recommended and let the temperature raise up to 46^0C (115^0F). Soap = 4 ounces per membrane.
3 Rinse your machine with half the number of water gallons it can concentrate per hour.
4 Wash the machine with ACID and let the temperature raise up to 46^0C (115^0F). The unit should soak as long as possible (maximum 1 month).
5, 6, and 7 Do another rinse and wash soap cycle followed by another rinsing as you had done in the three first steps.

Do a permeability membrane test.

- Fill the washing basin just to half of its capacity with permeate.
- Concentrate the permeate at 200 PSI pressure. Returning the permeate and concentrate to the washing basin. To do that, you must position the valves in washing soap cycle, close valve V18 and adjust the pressure to 200 pounds.
- Take down a reading of permeate flow when the temperature reaches 13^0C (55^0F). This reading will indicate you the filtration capacity of your membrane only without imply another factor such as temperature, biofilms or bacteria. A permeability test at 21^0C (70^0F) and 150 PSI, will give you the same lecture.
- Compare the permeate flow value with the one taken when the unit was manufactured or after you first utilisation during the season. You will evaluate in this way the permeability of your membrane.

8 If your membrane is clean, continue on step # 9. If you are not satisfied with the cleanness of your membrane, you can pursue this process on step # 4 or simply send back the membrane to be CLEANED at the factory.
9 Put 20 litres of permeate in the washing basin and 4 litres of glycol or glycerine. Add a teaspoon of preserve-osmo and let the water flow for 15 minutes. Then, stop your machine and HEAT the room all year between 5^0C and 10^0C.

P.S.: If the room is subject to **FREEZING**, put 10 litres of glycol or glycerine for each 4'' x 40'' membrane, 20 litres for each 8''x40'' membrane and 30 litres for each 8''x 60'' membrane in the wash basin and let the liquid run inside the machine (see annual storage with antifreeze).

3.6 ANNUAL STORAGE WITH ANTIFREEZE

It is possible to further insure adequate storage of your machine by storing it in a glycol and water solution and following instructions for the soap washing process. Before carrying out the annual storage process, you must be sure that the machine has been thoroughly cleaned.

3.6.1 PRESERVATION SOLUTION

This preservation solution will protect the machine against freezing during the winter months. The below table presents you the way to proceed.

Quantity	Description
20 liters	Glycol or glycerine for one membrane 8'' x 40''
30 liters	Glycol or glycerine for one membrane 8'' x 60''
½ ounce	Of préserve-osmo

Code	Quantity	Description
01260011	20 Liters	Glycol antifreeze alimentaire
01260051	4 Liters	Glycol antifreeze alimentaire
01260823	20 Liters	Glycerine alimentaire
01260824	4 Liters	Glycerine alimentaire

Proceed in the following way:

1. Valves positioned in washing soap cycle, with the exception of valve V19 (rinsing cycle)
2. Drain the washing basin.
3. Add the preservation solution.
4. To reduce the solution in the basin to 4 inches (bottom–up). Switch position in manual operation by 15 seconds period allowing in this way, the starting of the priming pump without the action of the pressure pump.
5. Valves position in washing soap cycle.
6. Do a solution circulation for a period of 10 minutes.

Following the above steps, drain the basin and the permeate output under the membrane housing.

4.0 MANUFACTURER GUARANTIE :

The **LEADER EVAPORATOR** reverse osmosis units are guarantied by the manufacturer against all fabrication vices for a period of two complete seasons, starting with the installation date of the unit. The manufacturer's responsibilities concerning this guaranty are limited to the fixing or replacement of parts as one desires by the manufacturer. All replaced pieces will be property of the manufacturer.

A. **Pellerin & Fils Ltée**. Will not be responsible for the damages that are results of negligence, misuse, lack of respect in the operation mode in a factory that result in damaging or injuries, or judicial pursuit.

5.0 EQUIPMENT DESCRIPTION :

The reverse osmosis unit that you have include the following components :

5.1 PHYSICAL DIMENSIONS :

MODEL	MEMBRANE	CAPACITY GPD	MEMBRANE PI^2 OF SURFACE	PRESSURE PUMP	DIMENSIONS (WxDxH)	PRE-FILTER
AE1014415C	1 X 4''x40''	2000	75	1.5 HP 110V, SS	28''x25''x52''	1X10''
AE014430C	1 X 4''x40''	2000	75	3 HP 220V, SS	28''x25''x52''	1X10''
AE024430C	2 X 4''x40''	4000	150	3 HP 220V, SS	28''x25''x52''	1X10''
AE034430C	3 X 4''x40''	6000	255	3 HP 220V, SS	28''x25''x52''	1X10''
AE044430C	4 X 4''x40''	8000	300	3 HP 220V, SS	28''x25''x52''	1X10''

Height : 52"	Width : 28"	Depth : 25"

Figure 13. ***illustrative model***

5.2 OVERPRESSURE PUMP :

A pressure pump allows the liquid pressurisation that will gives the desire filtration.

Some examples of pressure pump characteristics :

MOTOR	PRESSURE	FLOW		ELECTRICITY	
C.V	Pds/inch^2	GPM	PH	VOLTS	AMPS.
5	450	10	1	230	20
7.5	450	16	1	230	30

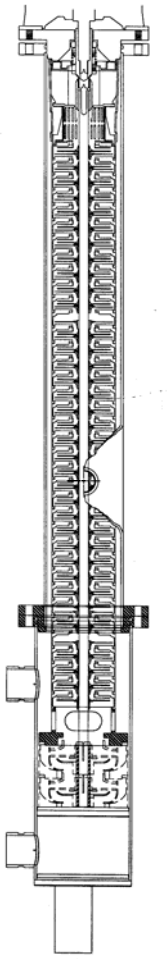


Figure 14. Overpressure pump

5.3 MEMBRANE HOUSING :

The membranes are installed at the interior of a housing with the following characteristics;

- material : stainless steel..... • dimension: 125 x 20 cm
- membrane quantity by housing.....1

01260007 Envelope 4”x40” in stainless steel

5.4 FRONT CONTROL PANEL :

The front control panel are constructed according to your needs, they have the following items:

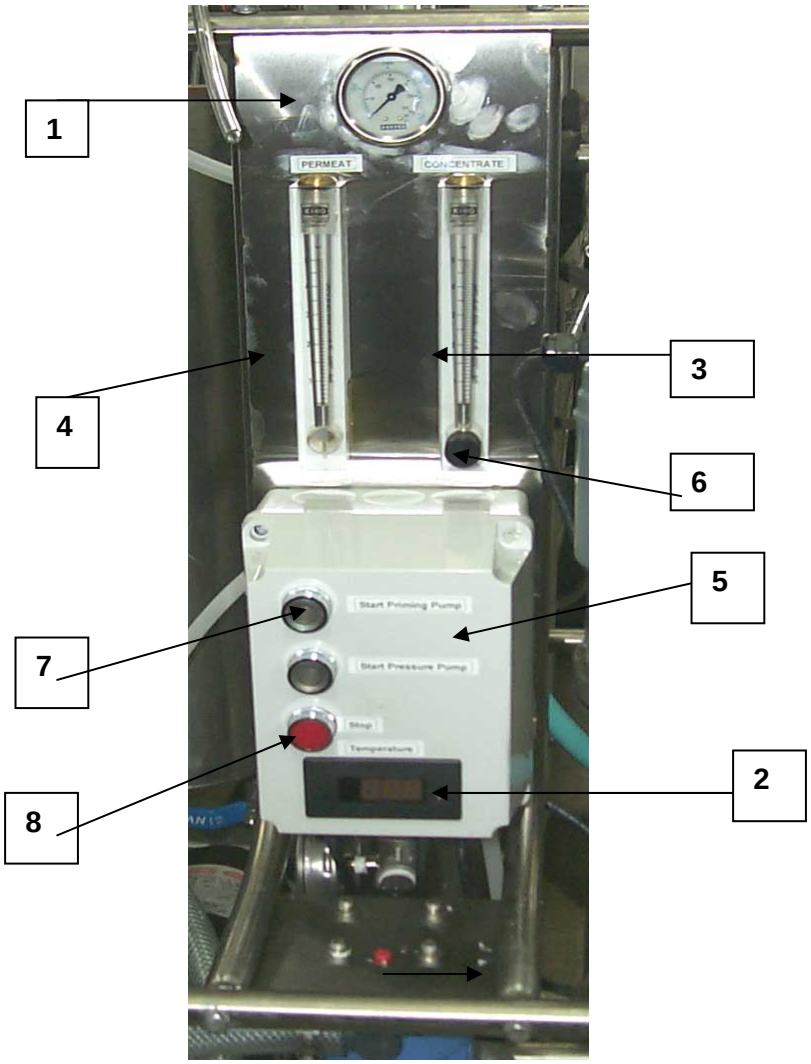


Figure 15. Front panel

CODE #	DESCRIPTION
01090021 1	PRESSURE INDICATOR (0-300 PSI)
01151198 2	TEMPERATURE DISPLAY
01260098 3	CONCENTRATE FLOWMETER
01260117 4	PERMEATE FLOWMETER
01150709 5	CONTROL BOX
01260422 6	FLOW VALVE V2
01150709 7	PRESSURE PUMP (white light)
01150706 8	HIGH TEMPERATURE (red light)

5.5 UNIT CONCENTRATION PERFORMANCE LECTURE :

The performance concentration lectures of the unit must be taking every time (day) that you use the reverse osmosis unit. This lectures are primordial to assure an efficiency maintenance of your membranes and to detect immediately all the lacunas at the time operation of your unit. This lectures must be taking half hour after the beginning of the concentration cycle. The following tables explain the procedure :

1) **Date :** data collection record day for the unit.

2) **Sap density :** in Brix degre when the temperature is 66°F.

3) **Concentrate density :** in Brix degre when the temperature is 66°F.

4) **Concentrate flow :** measure with a concentrate flowmeter lecture.

5) **Permeate flow :** measure with a permeate flowmeter lecture.

6) **Water temperature :** that is presently treated an the interior of the unit.

1. **Pressure in the membranes :** measure with a manometer lecture "membrane pressure".

	Density (Brix)		Flow (GPM)		Temp.	Pressure	Concentrate		Conc.
	Sap	Concen.	Filtrate	Conc.	Degre F.	Lbs/po^2	% de Concen.	Flow GPH	Or
1	**2**	**3**	**4**	**5**	**6**	**7**	100x(4/(4+5))	60x(4+5)	Test
june 6 02			7.5		55	200	75%	600	T
june 6 02	2.0	8.0	7.5	2.5	55	500	75%	600	C
june 6 02									

Figure 17. Unit performance table

Date	Density (Brix)		Flow (GPM)		Temp.	Pressure	Concentrate		Conc.
	Sap	Concen.	Filtrate	Co nc.	Degre F.	Po/inch^2	% de Concen.	Flow GPH	Or
1	2	3	4	5	6	7	100x(4/(4+5))	60x(4+5)	Test

Date	Density (Brix)		Flow (GPM)		Temp.	Pressure	Concentrate		Conc.
	Sap	Concen.	Filtrate	Conc.	Degre F.	Po/inch^2	% de Concen.	Flow GPH	Or
1	2	3	4	5	6	7	100x(4/(4+5))	60x(4+5)	Test

Figure 17. Production sheet for reverse osmosis

REVERSE OSMOSIS :	Membrane models	Serial number :
Serial number_____	1._____	1._____
Model _____	2._____	2._____
Pump _____	3._____	3._____
Motor_____	4._____	4._____

		ACID	ALKALINE SOAPS	OXYDIZERS
Hydranautic **PVD1**		4 oz Acid-Osmo	4 oz Sani-Osmo	
Filmtec **NF70-BW30**		4 oz Acid-Osmo	4 oz Sani-membrane	4 oz Oxy-membrane
Fluid System **TFC**		4 oz Acid-Osmo	4 oz Sani-membrane	4 oz Oxy-membrane

CONDUCTIVITY TEST

Membrane #	Conductivity		Temperature	Flow		Pressure
	Concentrate	Permeate	^{0}F	Permeate	Concentrate	psi
1						
2						
3						
4						

TEMPERATURE CONTROLLER

Temperature 48^{0}C (118^{0}F)	

ELECTRICAL TESTS

Dielectric test	_____OK
Total Amperage :	_____Amps.

PROTECTION AGAINST FREEZING

Density :_____	Temperature :_____

Salesman name :_____ _____	Buyer's name :_____ Order # :_____

Technician:_____ _____	Date_____

Fill up in case of malfunction

Our goal is to offer you an impeccable product. This is why every **REVERSE OSMOSIS** machine is thoroughly inspected at the factory. We ask that you help us improve our production methods by sending your comments to our production manager at this fax number: (819) 828-3408.

Do not forget to send us the reverse osmosis production sheet with a description of the problems encountered and their causes. We thank you in advance for your collaboration.

Comments:

Technician : _____ Date : _____

5.7 Correction factor for FLUID SYSTEM 8921S membrane										
Temp		Factor	Machine capacity GPH) corrected according to the temperature							
^{o}F	^{o}C	Corr. T	150	300	450	600	700	800	1000	1600
77	25	1,0000	216	433	649	865	1009	1154	1442	2307
75	24	1,0300	210	420	630	840	980	1120	1400	2240
73	23	1,0610	204	408	612	815	951	1087	1359	2175
72	22	1,0960	197	395	592	789	921	1053	1316	2105
70	21	1,1260	192	384	576	768	896	1025	1281	2049
68	20	1,1610	186	373	559	745	869	994	1242	1987
66	19	1,1960	181	362	543	723	844	965	1206	1929
64	18	1,2340	175	351	526	701	818	935	1169	1870
63	17	1,2720	170	340	510	680	794	907	1134	1814
61	16	1,3120	165	330	495	659	769	879	1099	1759
59	15	1,3540	160	319	479	639	745	852	1065	1704
57	14	1,3970	155	310	464	619	723	826	1032	1652
55	13	1,4420	150	300	450	600	700	800	1000	1600
54	12	1,4890	145	291	436	581	678	775	968	1549
52	11	1,5370	141	281	422	563	657	751	938	1501
50	10	1,5880	136	272	409	545	636	726	908	1453
48	9	1,6410	132	264	395	527	615	703	879	1406
46	8	1,6950	128	255	383	510	596	681	851	1361
45	7	1,7520	123	247	370	494	576	658	823	1317
43	6	1,8120	119	239	358	477	557	637	796	1273
41	5	1,8730	115	231	346	462	539	616	770	1232
39	4	1,9380	112	223	335	446	521	595	744	1191
37	3	2,0050	108	216	324	432	503	575	719	1151
36	2	2,0740	104	209	313	417	487	556	695	1112
34	1	2,1470	101	201	302	403	470	537	672	1075

To calculate the capacity of your unit : We suggest you to proceed in the following way :

The application formula is : $Corrected\ Flow\ (GPH) = \frac{(Flow\ (GPH))_{55^0F} * (Corr.T)_{55^0F}}{(Corr.\ desired\ Temp.^0F)}$

We can take an example to illustrate the formula application with the table showed above. You need to find out the flow of any unit at one temperature of 2^0C (36^0F) for example. You must take the flow value at 13^0C (55^0F) as a base value and multiply by the correction factor value (1.4420) at this temperature. Finally, divide them by the correction factor value at the desired temperature.

Data : Flow at 13^0C (55^0F) = 150 GPH, Temperature correction factor at 13^0C (55^0F) = 1,4420, and the desired temperature value = 2^0C (36^0F). So the correction factor value at this temperature is 2.0740.

$$Corrected\ Flow\ (GPH) = \frac{(150GPH)_{55^0F} * (1.4420)}{(2.0740)_{36^0F}} = \frac{216.3}{2.0740} = 104\ \text{GPH}$$

Figure 18. Correction factor sheet

WASHING AND TAKING CARE OF YOUR MEMBRANES

1. WHEN TO WASH THE MEMBRANES?

The filtration process and thus the membrane's performance vary depending on the type of membrane, exerted pressure on membrane, sap temperature, percentage of sugar in the concentrate, and presence of other components such as bacteria, biofilm and mineral salts. Therefore, it is important to maintain similar test conditions in each sampling. To do so, we recommend that you use the following method:

2. TESTING METHODS :

- Fill the washing basin just to half of its capacity with filtrate.
- Concentrate the permeate at 200 PSI pressure. Returning the permeate and concentrate to the washing basin. To do that, you must position the valves in washing soap cycle, close valve V18 and adjust the pressure to 200 pounds.
- Take down a reading of permeate flow when the temperature reaches 13^0C (55^0F). This reading will indicate you the filtration capacity of your membrane only without imply another factor such as temperature, biofilms or bacteria. A permeability test at 21^0C (70^0F) and 150 PSI, will give you the same lecture.
- Compare the permeate flow value with the one taken when the unit was manufactured or after you first utilisation during the season. You will evaluate in this way the permeability of your membrane.

3...WASHING FREQUENCY :

It is often difficult for the user to determine when and how to wash the membranes because the operating conditions vary according to many environmental factors. We have thus established a simple and efficient method to keep your membrane clean without putting it through a lot of washes. Otherwise it would wear out prematurely.

4 SOAP WASH :

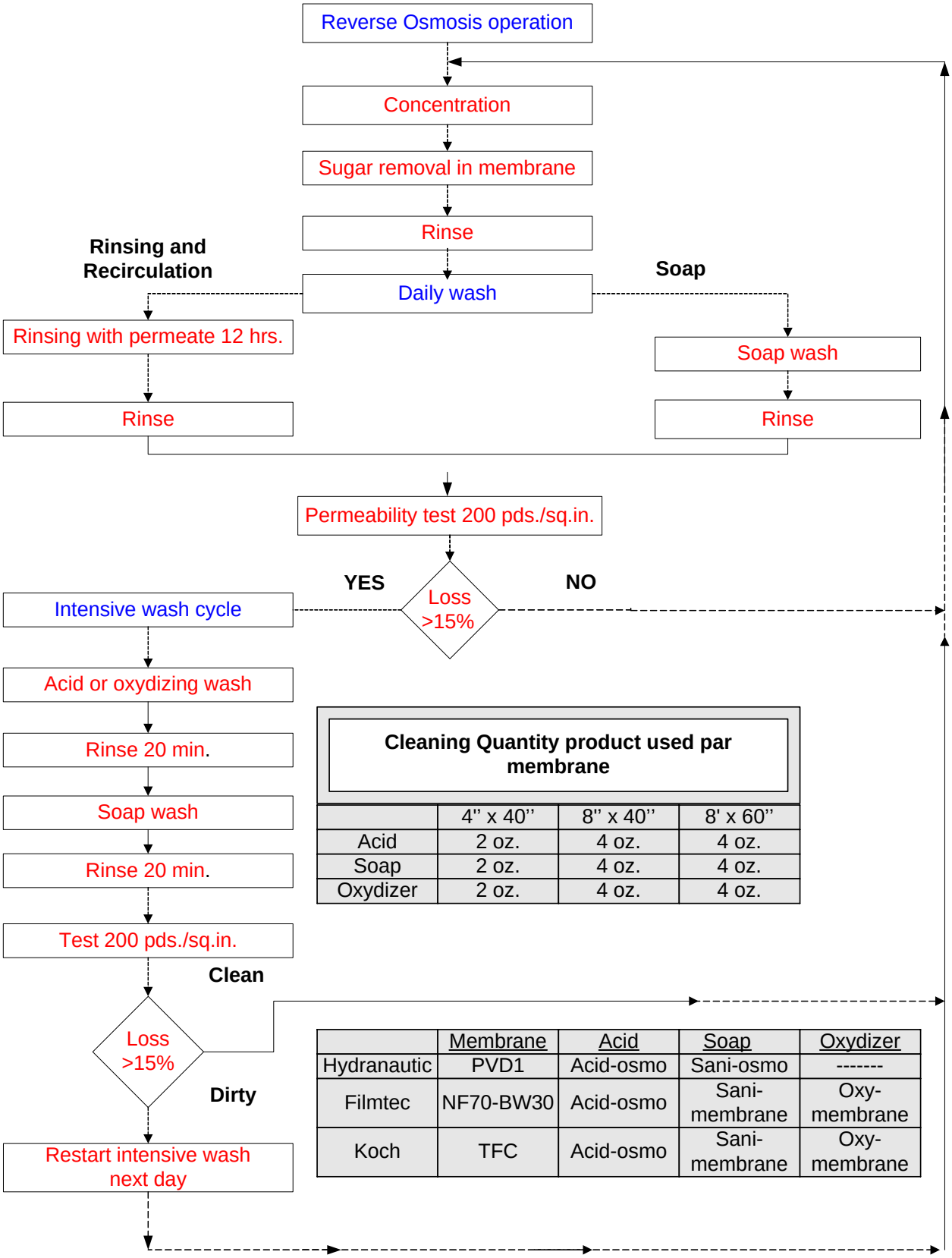
The LEADER EVAPORATOR soap wash is the key process to keeping your membrane clean. LEADER EVAPORATOR soap has been specially conceived to clean your membrane while providing the best capacity (in gallons per hour)/longevity ratio. This type of wash is efficient when the temperature reaches 43^0C (110 degrees F) but does not exceed 46^0C (115^0F) because this could change its properties. The recommended washing time is 30 to 45 minutes. It is more important that you be sure to have the right temperature conditions and the right amount of soap: **increasing the soap wash time or using another soap than LEADER EVAPORATOR soap could destroy your membrane.**

5 RECIRCULATION WASH

During this type of washing, in **recirculation mode**, the water contained in the permeate basin runs through the whole machine at the lowest possible pressure for 8 to 12 hours.

6 ACID WASH :

The acid wash is a very important process to keep your membrane clean. It helps getting rid of the biofilm and bacteria that develop when there are hotter periods in the season. To be efficient, the Osmo acid soaking has to last at least 8 hours. It can go on without damaging the membrane for up to four weeks. The acid wash is carried out following the **soap wash mode.**



Cleaning Quantity product used par membrane

	4'' x 40''	8'' x 40''	8' x 60''
Acid	2 oz.	4 oz.	4 oz.
Soap	2 oz.	4 oz.	4 oz.
Oxydizer	2 oz.	4 oz.	4 oz.

	Membrane	Acid	Soap	Oxydizer
Hydranautic	PVD1	Acid-osmo	Sani-osmo	-------
Filmtec	NF70-BW30	Acid-osmo	Sani-membrane	Oxy-membrane
Koch	TFC	Acid-osmo	Sani-membrane	Oxy-membrane