

## Concentration of grape must by reverse osmosis

When process engineers need to separate effluent streams, clarify or fractionate and where they demand reliable and repeatable performance, membrane filtration systems are often their first choice. At its most basic level membrane filtration involves separating a single flow stream into two separate streams, one more concentrated than the other, by passing it through a membrane filter. These streams can then either undergo further processing, or in the case of a waste-stream be diverted to an appropriate outlet.

**High quality wines can be produced from grape musts concentrated by Reverse Osmosis.**



PCI Membranes has many years experience in the design and manufacture of membrane filtration equipment, and specifically in constructing equipment to the very high standards required in the food, beverage and pharmaceutical industries. PCI has installed hundreds of membrane systems around the world.

Tubular reverse osmosis is a process well-suited for the concentration of grape must prior to vinification, since no pretreatment is required, and very high product quality is realised at economical cost.

PCI Membranes RO system uses tubular membranes of 12.5 mm diameter which prevents blockage from occurring without the need for prefiltration of the must. These tubular membranes can be easily and effectively cleaned in-place.

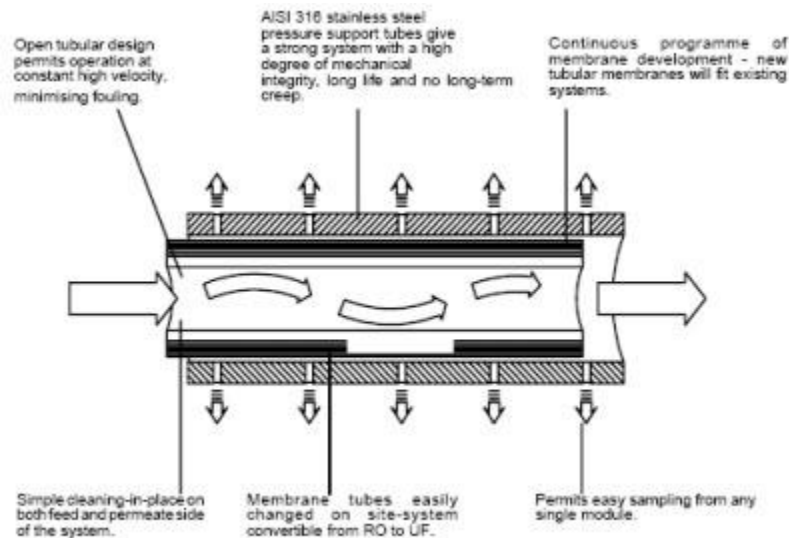
### High Quality Product

The grape must concentration process operates at ambient temperature thus avoiding losses of volatile aromas, and ensuring that the organoleptic qualities of the must are not modified. Red wine must from Cabernet, Sauvignon and Merlot grape varieties can be concentrated by RO up to a sugar content equivalent to 12-13% alcohol.

### Potential advantages of concentration by RO

- Concentrated musts are rich in tannin and in organoleptic components.
- Addition of sugar and rectified grape must prior to vinification may not be necessary, and in any case the quantity added is substantially reduced.

- The process does not affect the delicate balance of aroma compounds in the must, since neither freezing nor evaporation is necessary.



***The Reverse Osmosis Process***

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Reverse osmosis is a non-thermal process consisting of dewatering by the separation of pure water from liquid solutions (such as grape must) by the application of an elevated pressure which causes the water to diffuse through a polymeric membrane. The membrane is impervious to large molecules and retains the valuable components in the must. The process can operate at any temperature between 2°C and 80°C, and since there is no change of phase it is energy-efficient. Liquid flow within the system is tangential to the membrane surface thus inhibiting formation of deposits which would reduce processing capacity.

**PCI Membranes Experience**

<b>TYPICAL CHEMICAL COMPOSITION WHITE SAUVIGNON MUST</b>			
	<b>Raw Must</b>	<b>Chaptalised Must</b>	<b>RO Must</b>
<b>Reducing suger, g/l</b>	185.6	211.9	213.7
<b>Acidity, g/l H2SO4</b>	4.53	4.46	4.92
<b>pH</b>	3.31	3.31	3.30
<b>Tartaric acid</b>	7.42	7.38	7.73
<b>Malic acid</b>	3.22	3.22	3.80
<b>Potassium, mg/l</b>	1,402	1,374	1,428
<b>Free SO2 mg/l</b>	2	2	2
<b>Total SO2, mg/l</b>	33	35	
		<b>Chaptalised Wine</b>	<b>RO Wine</b>
<b>Degrees alcohol</b>		12.93	13.02
<b>Density 20/20</b>		0.9916	0.9920
<b>Residual sugar</b>		0.9	0.9
<b>Dry matter</b>		21.9	23.4
<b>pH</b>		3.35	3.34
<b>Total acidity</b>		4.43	4.70
<b>Tataric acid</b>		4.13	4.30
<b>Malic acid</b>		2.30	2.67
<b>Potassium mg/l</b>		725	703
<b>Volatile acid g/l H2SO4</b>		0.53	0.52
<b>Free SO2</b>		20	18
<b>Total SO2</b>		66	66
<b>Total iron</b>		1.0	1.1
<b>Optical density</b>		8.0	10.0
<b>Folin-Ciocalteu index</b>		9.0	10.8

PCI Membranes has obtained concrete experience in the concentration of grape must in the great wine districts of France, using a pilot RO unit processing musts from several grape varieties. The wines produced from these musts have shown excellent body and aroma, comparable with wines produced by traditional methods. PCI Membranes also has industrial references in USA, Canada and S. Africa.

- Case Study: Initial must volume 170 hl at 10° (potential alcohol)
- Initial batch volume 100 hl at 10°
- Water removed 28 hl
- Concentrated must 72 hl at 14.4°
- Final must volume 142 hl at 12°
- Processing temp 18 - 20°C
- Batch time 6 hours approx.
- Membrane type AFC99

- Membrane area 70 m<sup>2</sup>
- Overall dimensions L=3.7m,W=0.9m,H=2m
- Absorbed Power 26 kW
- Cleaning Procedure Daily 0.25% Ultrasil 11

Note: Investment and operating costs are a function of the membrane surface area employed, which is in turn dependent upon: potential alcohol of must volume of must processed

- processing temperature
- potential alcohol required

