

What is claimed is:

1. A reverse osmosis filtration system comprising:  
a set of two or more reverse osmosis pressure vessels coupled in series, each pressure vessel having:  
one or more reverse osmosis membrane elements;  
a feed inlet;  
a retentate outlet; and  
a permeate outlet, the pressure vessels being coupled so that each successive pressure vessel has (a) its feed inlet coupled to the retentate outlet of its preceding pressure vessel and (b) its permeate outlet coupled to the permeate outlet of its preceding pressure vessel, wherein the permeate outlet of at least one pressure vessel includes a front permeate outlet and the permeate outlet of at least one other pressure vessel includes a back permeate outlet, wherein the back permeate outlet of one pressure vessel is coupled to the front permeate outlet of a successive pressure vessel.
2. A filtration system according to claim 1, wherein the set includes up to 25 reverse osmosis pressure vessels.
3. A filtration system according to any one of claims 1 through 2, wherein each of the pressure vessels has three to four reverse osmosis membrane elements.
4. A filtration system according to any one of claims 1 through 3, wherein each reverse osmosis membrane element is spiral wound.
5. A filtration system according to any one of claims 1 through 4, wherein each reverse osmosis membrane element is about 37 to about 43 inches in length.
6. A filtration system according to any one of claims 1 through 5, wherein the filtration system is configured to filter ethanol from alcoholic beverages.

7. A filtration system according to any one of claims 1 through 6, wherein the permeate outlet of a last pressure vessel in the set is also coupled to the feed inlet of a first pressure vessel in the set to provide a recycling flow path.
8. A filtration system according to any one of claims 1 through 7, further comprising a first pass unit having a first stage unit and a second stage unit, wherein the set of two or more filtration vessels is distributed between the first and second stage units.
9. A filtration system according to any one of claims 1 through 8, wherein the feed inlet of a first one of the set of two or more pressure vessels is coupled to a high-pressure pump.
10. A filtration system according to claim 9, wherein an inlet of the high-pressure pump is coupled to a heat exchanger.
11. A filtration system according to claim 10, wherein an inlet of the heat exchanger is coupled to a low-pressure pump.
12. A filtration system according to any one of claims 1 through 11, wherein the permeate outlet of a first one of the set of two or more filtration vessels is coupled to a high-pressure pump.
13. A filtration system according to claim 12, wherein the high-pressure pump coupled to the permeate outlet is further coupled to an inlet of one of an additional set of reverse osmosis pressure vessels, each of the pressure vessels of the additional set being coupled in series to one another.
14. A filtration system according to any one of claims 1 through 13, further comprising a set of cleaning inlets coupled to a cleaning tank, each cleaning inlet coupled in parallel to a feed inlet or retentate outlet of a first end of a corresponding one of the set of pressure

vessels.

15. A filtration system according to claim 14, further comprising a set of cleaning outlets, each cleaning outlet coupled in parallel to a feed inlet or retentate outlet of a second end of a corresponding one of the set of pressure vessels.

16. A filtration system according to any one of claims 14 through 15, further comprising a low-pressure pump coupled to the set of cleaning inlets.

17. A filtration system according to any one of claims 1 through 16, wherein a permeate outlet of an intermediate one of the set of two or more pressure vessels is coupled to the feed inlet of a first of the set of two or more pressure vessels.

18. A filtration system according to any one of claims 1 through 17, further comprising at least one back-flow preventor configured to prevent a reverse surge of permeate through the one or more reverse osmosis membrane elements.