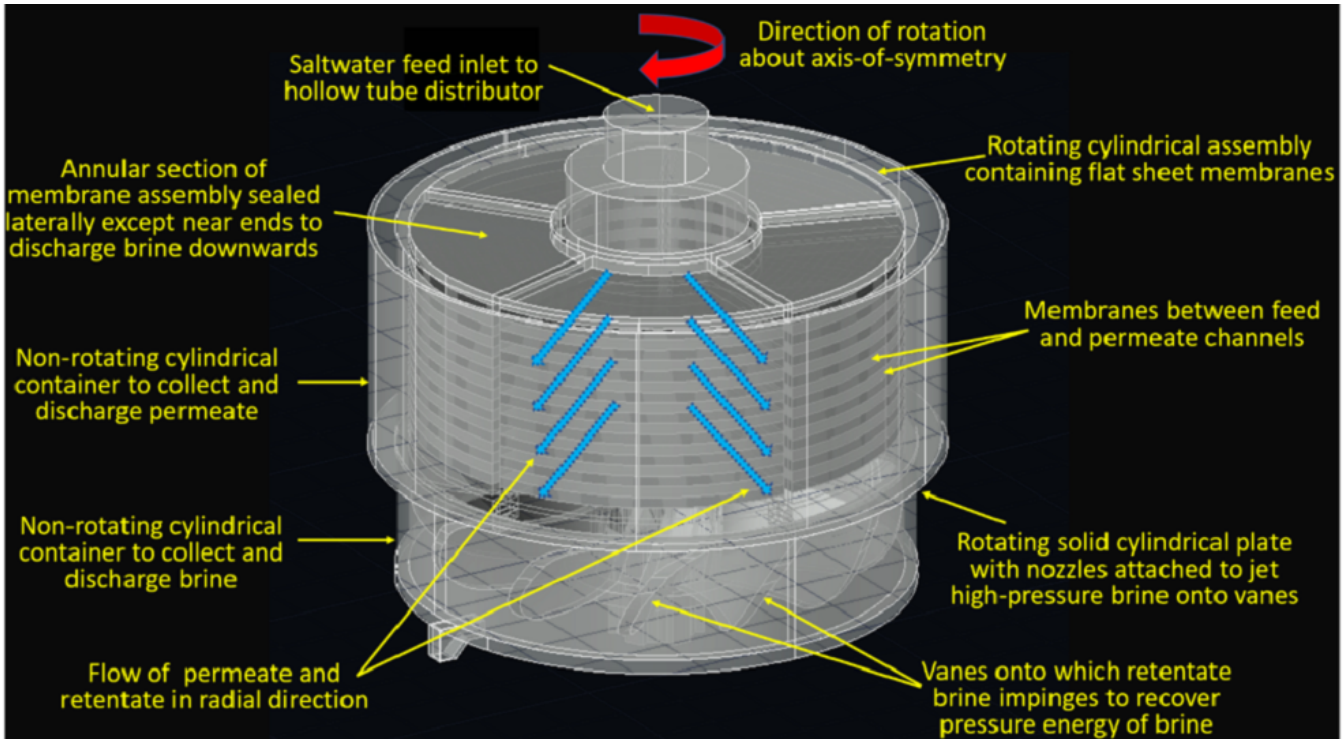
TECH OFFER

Cost-Effective Centrifugal Reverse Osmosis



KEY INFORMATION

TECHNOLOGY CATEGORY:
Environment, Clean Air & Water - Filter Membrane & Absorption Material
Environment, Clean Air & Water - Mechanical Systems

TECHNOLOGY READINESS LEVEL (TRL): TRL3
COUNTRY: SINGAPORE
ID NUMBER: TO174531

OVERVIEW

The increase in demand for freshwater during the 20th century has led to a global water-scarcity crisis suffered by 40% of the population in the world. The situation is exacerbated by contamination of freshwater resources, global climate change, industrialization, and rapid population growth. Less than 0.008% of the water on this earth is available for its current population of 7.7 billion people. The only way to increase our available freshwater supply is through desalination of seawater. Desalination via reverse osmosis (RO) membrane technology now dominates the world market. However, an endemic problem of RO desalination is its high-cost relative to freshwater sources. A major contributor to this disparity is the high-pressure pumping cost for RO.

Centrifugal reverse osmosis (CRO) can significantly reduce the pumping cost for RO because it operates close to the minimum energy required for separating freshwater from saltwater. It does this by rotating a membrane module to cause a centrifugal pressure that increases with increasing distance from the axis-of-rotation. As such, the local pressure is only slightly higher than

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the minimum required for RO. In contrast, conventional RO desalination employs a high-pressure pump to operate the entire membrane module at the maximum pressure. This novel CRO technology can reduce the energy required for a 50% recovery of freshwater from a typical seawater feed by over 30%.

The technology owner is seeking collaborations with companies interested in licensing this technology for pilot-scale testing and commercial application.

TECHNOLOGY FEATURES & SPECIFICATIONS

The unique feature of this technology is capitalizing on the increase in the centrifugal pressure generated by rotation of a membrane module about its axis that permits reverse osmosis at the minimum local pressure. For a typical seawater feed this can be accomplished with a membrane module having a radius of 72 centimeters rotating at 1000 rpm. This centrifugal reverse osmosis technology has the following features:

- Continuous process applicable to both small-and large-scale reverse osmosis applications
- Significant reduction in energy consumption relative to conventional technology
- Reduction in energy consumption enables operation at higher product recovery
- Straightforward scale-up for larger feed flowrates

POTENTIAL APPLICATIONS

This technology is applicable for reverse osmosis desalination of seawater as well as brackish and inland water resources. It also is applicable for reverse osmosis concentration of other solutes such as ethanol from the dilute aqueous solutions emanating from biomass technologies. Operation at higher water recovery results in a more concentrated brine product stream that be mined for valuable solutes such as lithium using in batteries and rubidium used in photoconductors.

UNIQUE VALUE PROPOSITION

- Significant reduction in cost of producing freshwater from seawater and other saline resources
- Significant reduction in cost of producing ethanol from dilute aqueous biomass solutions
- Cost-effective way to increase freshwater resources of the world
- Reduction in the cost to produce renewable energy sources such as ethanol
- Increase in recovery reduces cost of recovering solutes such as lithium and rubidium from seawater

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