

A Brief Review of Forward Osmosis Technology

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EDITORIAL NOTE

Forward Osmosis (FO) is a membrane method that treats two fluids at once using the osmotic pressure differential, allowing for energy-efficient water and wastewater treatment. Various uses are available, including industrial water management. The fundamental idea of FO is explained, and the state-of-the-art in FO application in industrial industries is described in this review study. FO has been used in the food and beverage business, chemical industry, pharmaceutical industry, coal processing, micro algae cultivation, textile industry, pulp and paper industry, electronic industry, and vehicle manufacture, among other industries. Heavy metal removal and cooling water treatment were also found in FO publications. However, FO has only been used in lab-scale experiments thus far. The next phase will be upscaling on a pilot or full-scale basis. Long-term fouling behaviour, membrane cleaning methods, and operation procedures are all important aspects that must be researched further. Furthermore, before full-scale FO can be applied in industries, energy and economic assessments must be completed. Micro, ultra, and Nanofiltration, as well as reverse osmosis, are examples of technologies (MF, UF, NF, RO). Pumping creates a transmembrane pressure difference, which they employ. Impurities are rejected as water molecules travel through the membrane. These pressure-driven membrane processes have a significant energy requirement. Forward osmosis (FO) is a membrane technology that generates a water flow through the membrane by using the osmotic pressure differential between two solutions. As a result, just a little amount of external energy is required, resulting in energy-efficient water treatment. Forward osmosis is a method that treats two liquid streams using a membrane. The operational

concept is depicted in. The so-called feed solution is on one side of the Feed Solution (FS). The FS's osmotic pressure is low. The so-called Draw Solution (DS), which has a higher osmotic pressure, is on the other side of the membrane. FS and DS are separated by a semi-permeable membrane. Water travels through the membrane from the FS to the DS side due to a change in osmotic pressure. The DS is diluted by the diffusing water, while the FS is concentrated. Physical pressure is rarely required.

As a result, the only source of energy is the pumping of FS and DS through the flow channels next to the membrane. FO has the following advantages over other treatment technologies:

- low usage of energy.
- In one treatment phase, two streams are treated simultaneously.
- Because there is no compression, fouling layers are easily removed.
- Liquids that aren't suited for other membrane processes are treated.

Forward osmosis is a viable alternative for manufacturing firms who want to save energy by using less water. FO applications in the food and beverage industry, chemical industry, pharmaceutical industry, coal processing, micro algae cultivation, textile industry, pulp and paper industry, electronic industry, and automobile production have all been studied thus far. Heavy metal removal and cooling water treatment were also discussed in articles, both of which could be connected to industries. Forward osmosis was used to treat wastewater, dilute a fluid product, or concentrate a fluid product.

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