

Smart Membrane- Based System for Cheaper and Sustainable Water Desalination

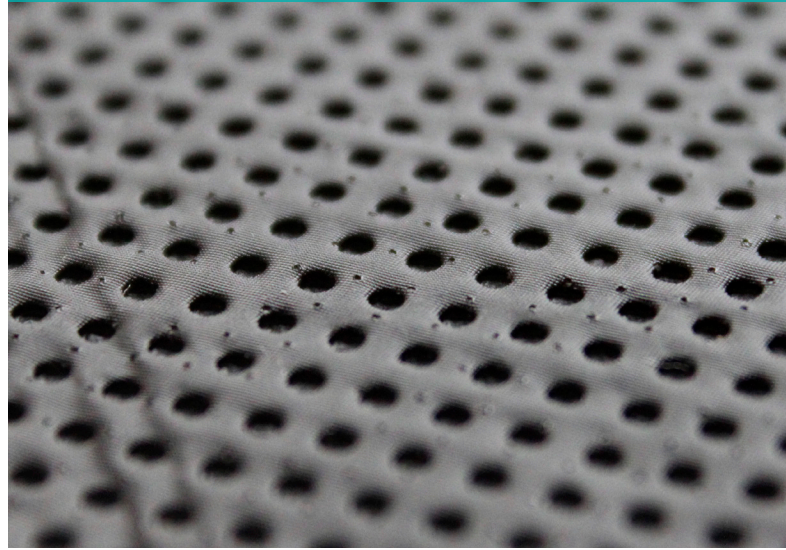
*Cost saving and real-time performance
monitoring for membrane-based desalination*

Among conventional and innovative water desalination technologies, membrane distillation has great potential for providing both a sustainable and high-quality water supply.

Membrane distillation is a thermally-driven membrane-separation process. With this process, only water vapor passes through the microporous hydrophobic membranes. Current membrane distillation technologies are prone to membrane fouling and scaling. This can reduce production rate, cause a system shutdown for cleaning and may increase operational costs.

This new technology provides an early detection for membrane fouling and real-time characterization of the membrane's overall condition. It supports decision making for membrane cleaning and reduces operational costs. This is achieved through advanced soft sensing algorithms, which rely on a physical model of the process and readily available outlet temperatures. The method estimates the temperature inside the module, which can be used to find optimal operating conditions.

TECHNOLOGY OPPORTUNITY



Benefits

- ▲ Monitoring of the membrane distillation system performance
- ▲ Early detection of fouling and other potential anomalies
- ▲ Spatial localization of the anomalies along the membrane
- ▲ Does not require extra sensors as the estimation is done using software
- ▲ Estimation of the spatial temperature and membrane characteristics

Applications

- ▲ Membrane based water desalination systems (e.g., membrane distillation and reverse osmosis)

Opportunity

This technology is part of KAUST's technology commercialization program that seeks to stimulate development and commercial use of KAUST-developed technologies.

Opportunities exist for joint development, patent licensing, or other mutually beneficial relationships.

For More Information

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Technology Details

Monitoring a process such as water desalination often requires taking physical measurements and understanding the overall state of the system. However, the main challenge for membrane-based desalination processes is the limited access to data. If additional temperature measurements from the membrane surface could be obtained, they would provide crucial information on the condition of the membrane.

This invention provides additional temperature measurements without using additional sensors. The measurements can be used to detect anomalies at an early stage.

How It Works

The software combines a mathematical model with readily available real-time measurements. It analyzes outlet temperatures and production rates to estimate the membrane surface temperature and characteristics. The deviation of the estimated membrane characteristics from their nominal values and changes in the temperature values at the membrane surface are analyzed to provide a decision about the status of the membrane.

Why It Is Better

This technology uses soft sensing, which requires fewer sensors to estimate the condition of the membrane and the spatial temperature distribution. This, in turn, reduces the manufacturing cost. It also provides the advantage of localizing the anomaly at the membrane level. This allows for a better monitoring and cheaper cleaning process.

IP Protection

KAUST has several patents pending for this technology.



INNOVATION
AND ECONOMIC
DEVELOPMENT